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INSTITUTE OF GAS TECHNOLOGY

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GAS ABSTRACTS

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O. P. BRYSCH, Editor

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1. GAS INDUSTRY

Gas Growth

Zachry, C. H. LET'S GUARD OUR 'PLACE IN THE SUN'. *Amer. Gas Assoc. Monthly 39,* 7-8, (1957) May.

The author cites the following principle as fundamental in the future growth of the gas industry: to provide the best possible service at fair rates; to conduct our business as to deserve public confidence; to aid in activities for building the communities we serve; to train and develop our employees; to maintain our faith in the future of our country; to maintain our faith in the progress of our industry; and to stress the sale of our worthy product.

H. L. Feldkirchner

$20 BILLION RESTAURANT SALES BY 1960. *Amer. Gas Assoc. Monthly 39,* 27-29, 35 (1957) May.

The recent meeting of the A.G.A. Sales Conference on Industrial and Commercial Gas held in New Orleans is discussed.

H. L. Feldkirchner

Gas Reserves

Amer. Gas Assoc. and Amer. Petroleum Inst. PROVED RESERVES OF CRUDE OIL, NATURAL GAS LIQUIDS AND NATURAL GAS. DEC. 31, 1956, Vol. No. 11, New York: Amer. Gas Assoc., (1957) May; U. S. NATURAL GAS RESERVES SHOW GREATEST ANNUAL GAIN, NEW PEAK. *Gas Age 119,* 11-14 (1957) April 18; *Amer. Gas Assoc. Monthly 39,* 2-6 (1957) April.

The A.G.A. and A.P.I. reported that the largest annual increase in proved recoverable natural gas reserves was recovered in 1956. The reserves now stand at an all-time high of 237.8 trillion cu ft. Peak production in 1956 consumed only 44% of the additions to reserves in that year. Four large tables giving the reserves and production by State and by past years are presented, covering natural gas liquids and liquid hydrocarbons as well as natural gas. Data on crude oil and natural gas liquids in Western Canada are given. E. B. Shultz

Safety

Kendall, T. H. SAFETY NEEDS MANAGEMENT SUPPORT. *Amer. Gas Assoc. Monthly 39,* 17, 51, 52 (1957) May.

Only when the chief executive takes an active interest does program prove successful. The prevention of accidents definitely should be the responsibility of management personnel and the supervisory people at the various locations of company operations. H. L. Feldkirchner

MacCutcheon, S. M. A 24-HOUR-DAY SAFETY PROGRAM. *Ind. Eng. Chem. 49,* 83A-84A (1957) April.

Dow Midland Plant is trying a new system, encouraging the employees to take part in a Home Safety Program. They are hoping to increase interest and participation in the plant program, and to reduce time lost as a result of off-the-job accidents. C. A. Simms

Whyte, B.A.C. THE PROGRESS OF SAFETY. *Gas World* (British) *145,* Coking Sect. 72-78 (1957) April 6; Cokg. Sect. 100 (1957) May 4.

Accident prevention in Britain is discussed, together with programs, legislation and results there, and in USA and the I.L.O. O. P. Brysch

Technical Writing

Nicholson, S. AUTHORSHIP AND COMPANY POLICY. *Research and Eng. 3,* 28-30, 32, 35 (1957) April.

A poll of 40 American companies indicates that industry is much concerned with increasing the number of technical articles written for publication. Aspects of encouragement, needs and quality of writing are cited.

O. P. Brysch

2. APPLIANCES

Air Conditioning

GAS COOLING RESEARCH STEPPED UP. *Amer. Gas Assoc. Monthly 39,* 11, 50 (1957) May.

The gas industry has initiated an intensification of its air conditioning research program aimed at the earlier development of additional types of gas air conditioning equipment.

Editors' Abstract

Automatic Ranges

Reiter, S. H. AUTOMATION LEADS TO MORE GAS RANGE SALES. *Gas Age 119,* 24-26 (1957) March 21.

The use of the automatic top burner heat control (Pantrol), which performs the same duties for the top burner as the oven thermostat does for the oven, is described in some detail. E. B. Shultz

House Heating

GAS HEATED HOMES UP 1.3 MILLION. *Amer. Gas Assoc. Monthly 39*, 9, 10, 35 (1957) May.

Figures are given for existing and potential U. S. gas househeating customers and for anticipated additional gas househeating customers for the years 1957-1960.

H. L. Feldkirchner

German Appliances

Zimmer, K. NEUE GASGERAETE-KONSTRUKTIONEN AUF DER KOELNER FRUEHJAHRSMESSE 1957. (NEW DESIGNS OF GAS APPLIANCES AT THE 1957 COLOGNE SPRING FAIR). *Gas-und Wasserfach* (German) *98*, 361-66 (1957) April 12.

For the first time the Cologne Spring Fair presented a new thermoelectric ignition safety device on gas ranges which regulates all burners independently of the type of gas. Another interesting feature was the "Krefftomat", a device which regulates the cooking process automatically. When the food has reached boiling temperature this device lowers the flame and keeps on cooking until the timing mechanism shuts it off. This device operates independently of the amount of food and is designed so that it fits 3 different pot-sizes. These and many other improvements exhibited on space heaters and warm water boilers show that the appliance industry is in a continuous state of development.

G. Kunst

Target Burners

Griffiths, J. C. and Weber, E. J. THE DESIGN AND APPLICATION OF IMPINGEMENT TARGET BURNERS. Bulletin 75, Project DA-5-GU, Amer. Gas Assoc. Labs.; $2.00; New York (1957) April.

This type of burner is inherently noisier than the Bunsen-type and has undesirable flame characteristics with manufactured gases. This work evaluates the effects of target burner design variables on performance, and means of minimizing these disadvantages. Use of target burners in appliances is demonstrated in a gas storage water heater, a domestic range top, and a central heating furnace.

Authors' Abstract

3. COMBUSTION AND INDUSTRIAL FURNACES

Air Pollution

Dudley, A. R. HOW CONTROL OVER SO_2 EMISSION REDUCES AIR CONTAMINATION. *Chem. Eng. Prog. 53*, 154M - 156M (1957) March.

People living in industrial communities have become more concerned about air pollution. This article describes the results of an effort to reduce sulfur dioxide contamination at the Baytown refinery of Humble Oil and Refining Co. To date SO_2 contamination has been reduced 78% by reducing acid usage and installing acid regeneration plant and Girdler scrubbing. Further scrubbing of sour gases is planned and by 1958 reduction in contamination will be 98%.

C. L. Tsaros

Carbon Arc Furnace

Davis, T. P. THE CARBON ARC IMAGE FURNACE. *Ind. Heating 24*, 496-504 (1957) March.

Carbon arcs can be used as a source of radiation which can be focused on the work to study high temperature phenomena. Three types of optical systems for measuring and controlling the radiation are discussed.

R. T. Ellington

Drying Ovens

Walter L. RADIANT HEAT OVENS—THE PRINCIPLES INVOLVED. *Gas World* (British) *145*, (Indust. Gas Sect.) 64, 65 (1957) March 16.

Characteristics of gas infrared heating ovens for drying are discussed. Installations and operations are briefly mentioned.

O. P. Brysch

Dust Explosions

Hartmann, I. RECENT FINDINGS ON DUST EXPLOSIONS. *Chem. Eng. Prog. 53*, 107M - 111M (1957) March.

The Bureau of Mines is carrying out a comprehensive study of dust explosions. This covers evaluation of explosive characteristics of all types of combustible dusts and powders, and studies of various parameters that affect explosibility; basic research on the mechanism of ignition of dust particles and the propagation of combustion waves through dust clouds; in-

vestigations in partly open chambers or galleries, ranging in volume from 1 to 216 cu. ft., and in ducts, on explosion venting, flame speeds, flame quenching, and related problems. Effects of particle size, percent moisture, percent inerts, on explosibility are shown graphically as are variables affecting flame velocity.

C. L. Tsaros

Flame Research

Cohen, L. and Simpson, P. BURNING VELOCITIES OF HYDROGEN CYANIDE IN AIR AND IN OXYGEN. *Combustion and Flame* (British) *1*, 60-62 (1957) March.

The burning velocities of hydrcgen cyanide in air and in oxygen have been measured for the first time. Maximum velocities of 55 cm/sec in air and 540 cm/sec in oxygen were observed.

Authors' Abstract

Fristrom, R. M., Prescott, R. and Grunfelder, C. FLAME ZONE STUDIES: III—TECHNIQUES FOR THE DETERMINATION OF COMPOSITION PROFILES OF FLAME FRONTS. *Combustion and Flame* (British) *1*, 102-113 (1957) March.

This paper describes techniques for making measurements on the composition of a flame front as a function of position. Aerodynamic and temperature profiles are available from other studies. The information can be used to determine reaction rates and to deduce reaction mechanisms and activation energies. The information is equivalent to that obtained in the most extensive conventional reaction kinetic studies and offers a fertile field for the study of many very fast reactions. Since these techniques are new, detailed consideration is given to the question of reliability and interpretation of the results. It is concluded that composition profiles can be measured with useful precision. Authors' Abstract

Grover, J. H., Kesler, M. G. and Scurlock, A. C. PRELIMINARY EVALUATION OF A ROTATING FLAME STABILIZER. *Jet Propulsion 27*, 386-91 (1957) April.

The effect on flame stabilization and combustion efficiency of a rotating rod-shaped stabilizer was studied. In comparison to a stationary stabilizer of similar shape, the effect of rotation was to increase the blow-off potential, but also to increase the combustion efficiency. Power requirements are sufficiently small for practical application. S. A. Weil

Hall, A. R., McCoubrey, J. C. and Wolfhard, H. G. SOME PROPERTIES OF FORMALDEHYDE FLAMES. *Combustion and Flame* (British) *1*, 53-59 (1957) March.

Some properties of the flames of formaldehyde with oxygen and nitric oxide, notably the spectra and oxygen index, are reviewed and compared with those of its main thermal decomposition products, i.e. carbon monoxide and hydrogen on the one hand and of organic bodies on the other. Some deductions are made about the combustion mechanisms with the formaldehyde flames. The usefulness of spectral data obtained is illustrated.

Holliday, D. K., and Thring, M. W. THE RADIATION FROM FLAMES IN A SMALL-SCALE OIL-FIRED FURNACE. *J. Inst. Fuel 30*, 127-136 (1957) March.

Flame emissivities and temperatures were measured throughout a turbulent jet diffusion flame for fourteen hydrocarbons. Flame emissivity was found to depend on C/H ratio and boiling point. Specific luminosity was found to agree with Ijmuiden results. R. T. Ellington

Palmer, H. B. THE STRUCTURE AND SHAPE OF FLAMES. *Gas Age 119*, 32-38, 63 (1957) March 7.

A review of the present knowledge of the detailed structure of diffusion and premixed flames. Aspects that require further investigation are discussed. S. A. Weil

Potter, A. E. Jr. and Berlad, A. L. A RELATION BETWEEN BURNING VELOCITY AND QUENCHING DISTANCE. Nat. Adv. Comm. Aeronautics Techn. Note 3882, (1956) November.

The product of burning velocity and quenching distance is proportional to a term which has the character of a thermal diffusivity and a term which increases with the activation energy of the flame reaction. The quotient of burning velocity and quenching distance is proportional to the average flame reaction rate and to terms which are mildly dependent on the flame reaction activation energy and the transport properties. Authors' Abstract

Robertson, W. W. and Matsen, F. A. SELF COMBUSTION OF ACETYLENE III — EFFECT OF OXYGEN AND ETHYLENE OXIDE. *Combustion and Flame* (British) *1*, 94-98 (1957) March.

The self combustion of acetylene is promoted by the addition of small amounts of ethylene oxide and oxygen. Benzene formation appears to go through a different initiation mechanism from that of the bulk of the reaction; it appears to be wall inhibited. Authors' Abstract

Flame Stability

Blackshear, P. L. Jr. GROWTH OF DISTURBANCES IN A FLAME-GENERATED SHEAR REGION. Nat. Adv. Comm. Aeronautics Techn. Note 3830 (1956) November.

This paper contains a stability analysis of the flow field that arises when a flame is anchored in a duct and an experimental examination of the growth of disturbances imposed on an anchored V-flame in a duct. The stability analysis shows that the flow is stable to all symmetric disturbances, and unstable to antisymmetric disturbances having wavelengths greater than the critical wavelength. This critical value is 2½ times the local flame width for flames filling a small fraction of the duct and becomes infinite when the flame fills the duct. Roughly similar results obtain for the V-flame. The rate of heat release in a flame in a duct can be increased by introducing disturbances that the flame zone can amplify.
Author's Abstract

Kurz, P. F. STABILITY LIMITS OF FLAMES OF TERNARY HYDROCARBON MIXTURES. *Combustion and Flame* (British) *1*, 3-13 (1957) March.

Studies of lean blow-off and flash-back limits of laminar flames of ternary hydrocarbon mixtures containing ethylene show that these stability limits of the mixtures are predictable. The fuel components are non-interfering in flames at these limits. The contributions of the individual hydrocarbons are additive and define the limit of the mixture. The rich blow-off limits of mixtures containing ethylene are not usually predictable. Author's Abstract

Furnace Atmospheres

Cullen, O. E. SELECTION AND APPLICATION OF FURNACE ATMOSPHERES. *Ind. Heating 24*, 465-74 (1957) March.

The article discussed modification of a basic atmosphere containing approximately 20% CO, 40% H_2, 40% N_2 for use in carbonizing carbonitriding, recarbonizing, and clean hardening. The author shows why this composition range is best for the accurate measurement and control of atmosphere dewpoint necessary for carbon control. R. T. Ellington

Spangler, F. L. STEAM, ATMOSPHERE, HEAT TREATING PROMOTES SPECIAL METAL CHARACTERISTICS. *Ind. Heating 24*, 478-88 (1957) March.

Steam can be used advantageously as a heat treating atmosphere for certain operations for both ferrous and non-ferrous metals in the lower temperature ranges. R. T. Ellington

Gas Flammability vs Pressure

Kennedy, R. E., Scott, G. S. and Zabetakis, M. G. FLAMMABILITY LIMITS OF HYDROCARBONS AT HIGH TEMPERATURES AND PRESSURES. *Chem. Eng. Prog. 53*, 125M-126M (1957) March.

Widespread use of high temperatures and pressures has introduced hazards not connected with less severe conditions. For example, the upper limit of flammability of natural gas in air rises from 14% at 0 psig to 44% at 800 psig and 60% at 3000 psig. The lower limit decreased from 5% at 0 to 2.3% at 10,000 psig. The spontaneous ignition temperature may decrease for some combustibles when the system pressure is increased. Results of an experimental program are discussed. C. L. Tsaros

Heat Treating

Peck, C. E. APPLICATIONS OF FURNACE ATMOSPHERES. *Metal Progress 71*, 104-12 (1957) March.

The author recommends certain atmospheres for bright annealing, bright hardening, carburizing, or carbo-nitriding of all varieties of plain and alloy steels. Suggestions are given, for the atmospheres conventionally used, as to dew points and carbon potentials. R. T. Ellington

Ignition

Blackburn, G. F. BIBLIOGRAPHY ON IGNITION AND SPARK-IGNITION SYSTEMS. Natnl. Bur. Standards Circ. 580 (1956) November.

Approximately 425 references to books, papers, and reports are listed, on ignition of combustible gaseous mixtures, and ignition apparatus. It includes ignition by electric sparks and arcs, and by hot surfaces. The references on ignition apparatus are for the most part on ignition systems and components for internal-combustion engines, with spark plugs listed separately. Author's Abstract

Robertson, W. W. and Matsen, F. A. A COOL FLAME PHENOMENON IN THE COMBUSTION OF ACETYLENE. *Combustion and Flame* (British) *1*, 99-101 (1957) March.

Ignition limits were determined on adding small concentrations of oxygen to heated acetylene in a flow system. A "cool flame" was observed when the reactor contained fresh carbon. Authors' Abstract

Incinerators

Rehm, F. R. INCINERATOR TESTING AND TEST RESULTS. *J. Air Pollution Control Assoc. 6*, 199-204 (1957) February.

Special problems in sampling and determination of dust-load in incinerator effluents are discussed, based upon methods of ASTM and of Western Precipitation Corp. in Milwaukee municipal incinerators. O. P. Brysch

Ore Reduction

Squires, A. M. and Johnson, C. A. THE H-IRON PROCESS. *J. Metals 9*, 586-90 (1957) April.

For over 12 years, Hydrocarbon Research Inc., has studied the direct reduction of iron ore fines with hydrogen in fluidized beds, operating at temperatures below 1000° F., and at pressures above 200 psig. In conjunction with Bethlehem Steel Co., a demonstration-scale direct-reduction plant has been put in operation in Trenton, N. J. Experience with this plant has provided information necessary for construction and operation of a commercial direct-reduction facility.

Authors' Abstract

Stelling, O. and Pereswetoff-Morath, I. G. M. (assigned to Otto Stelling) PROCESS OF TREATING PULVERULENT IRON OXIDES. U. S. 2,780,537 (1957) February 5.

Iron oxides are mixed with large proportions of iron carbide and the mixed powders are fluidized with carbon monoxide-hydrogen reducing gases at temperatures between 400° and 900° C. The iron oxides are thereby partly converted to iron carbides, which mixture may subsequently be converted to metallic iron by heating in another vessel at 800° C., with liberation of CO and CO_2.

E. B. Shultz

Nuclear Power

Johnson, W. E., Fax, D. H. and Townsend, S. C. THE P.A.R. HOMOGENEOUS REACTOR PROJECT. *Westinghouse Eng. 7*, 34-39 (1957) March.

The Pennsylvania Advanced Reactor Project (PAR) is a major effort sponsored by Westinghouse Electric Corp. and Pennsylvania Power and Light Co., the object of which is the design of an aqueous homogeneous nuclear power plant of 150,000 kw rated capability, planned for 1962. This requires considerable research into homogeneous reactor concepts, components and prototype reactors. The basic advantages of homogeneous reactors over the fixed fuel or heterogeneous types are: a) heat transfer occurs directly from the circulated uranium solution to the heat absorbing medium thus obviating the usual problem of transferring heat from fuel element through a cladding material; b) fission products can be removed and new fuel solution added continuously to the reactor; c) homogeneous reactors can be inherently more stable with respect to power surges and d) a fuel breeding cycle can be incorporated through the use of thorium oxide in a single or in a two region slurry. The disadvantages of homogeneous reactors include: a) increased corrosion, b) instability of solutions and c) loss of delayed neutrons from the reactor core. It is hoped that nuclear fuel costs will be less than for fixed fuel reactors.

C. G. von Fredersdorff

THE EBWR GOES CRITICAL. *Ind. Lab. 8*, 5-7 (1957) March.

The 5000-KW Experimental Boiling Water

Reactor, at Argonne National Laboratories, has been placed on stream as a major step forward in evaluation of boiling reactor technology. The reactor is designed to develop 20,000 kw heat in its initial loading of 6.1 tons of 1.44% enriched uranium. C. G. von Fredersdorff

TECHNICAL BRIEFS. *Power 101,* 158, 160, 207-218 (1957) March.

An estimated cost breakdown table is shown including both capital and operating expense for the proposed Indian Point, N. Y. nuclear power plant. Using oil fired superheaters, the capital cost for the 236,000 kw plant is $233/kw. Production cost is estimated at 0.888¢/kw hr of which 0.48¢/kw hr is for fixed charges. J. M. Reid

Spray Flammability

Burgoyne, J. H., MIST AND SPRAY EXPLOSIONS. *Chem. Eng. Prog. 53,* 121M - 124M (1957) March.

Two classes of finely divided liquid suspensions exist; condensed mists formed by condensation of vapor, and mechanical sprays, formed by mechanical dispersion of liquids. In the former, most drop diameters are less than 0.01 mm., in the latter, most are above 0.1 mm. Such suspensions can propagate flames. The condensed mists exhibit lower limits of flammability similar to vapors. As the drop diameter increases from 0.01 to 0.14 mm. the lower limit of flammability (oz. per cu. ft.) decreases. Precise upper limit values are not known. C. L. Tsaros

Steam Generation

Profos, P. DYNAMICS OF PRESSURE AND COMBUSTION CONTROL IN STEAM GENERATORS. *Combustion 28,* 34-44 (1957) March.

This very interesting article describes the interrelation of various effects in the overall system when adapting power production to demand. Transient and frequency response characteristics of the firing system, thermal inertia, storage in boiler, storage in piping, high-pressure turbine, reheater and low-pressure turbine are discussed. Control programming systems and correspondence between calculated and actual system performance are also given. R. T. Ellington

Surfaces in Oxidation

Egerton, A. C., Minkoff, G. J. and Salooja, K. C. THE SLOW OXIDATION OF METHANE—THE ROLE OF THE SURFACE ON THE COURSE OF THE OXIDATION OF METHANE. *Combustion and Flame* (British) *1,* 25-51 (1957) March.

Using methods previously described, the effects of surfaces of various kinds on the course of the reactions have been studied at temperatures from 450° to 500° C and pressures from 100 to 400 mm Hg. The amounts of the intermediates, formaldehyde and hydrogen peroxide, have been determined. It is concluded that other intermediates besides formaldehyde are controlling the rate and, as in the hydrogen-oxygen reaction, the radical HO_2 plays an important part through the reaction $HO_2 + CH_4 = H_2O_2 + CH_3$. Authors' Abstract

4. GASIFICATION AND CARBONIZATION

Coal Gasification

Alleman, C. E. (assigned to Phillips Petroleum Co.) APPARATUS FOR GASIFYING COAL. U.S. 2,786,660 (1957) March 26.

A system for the underground gasification of coal is described in which air or oxygen, steam and fuel gas are introduced at high pressure into the coal seam through a jet tube for control of the gasification temperature. E. J. Pyrcioch

Lang, E. W., Smith, H. G. and Bordenca, C. CARBONIZATION OF AGGLOMERATING COALS IN A FLUIDIZED BED. *Ind. Eng. Chem. 49,* 355-59 (1957) March.

In a pilot plant program for a continuous, fluidized-bed process for low-temperature carbonization of Alabama coking coals, agglomeration was best overcome by internal blending of raw coal with a stream of at least 10 parts of hot char. Heat was provided by internal combustion of char with air. Internal combustion in the presence of volatile products did not appreciably reduce tar yields. Yields were 1600 pounds of fuel char, 21 gallons of tar, and 13,000 cubic feet of 140 B.t.u. gas per ton of coal charged. Typical tar had a specific gravity of 1.10 and a pitch content of 51.8%. Distillable oil from tar contained 28.5% tar acids, 2.9% tar bases, and 68.6% neutral oil. Neutral oil contained 8.1% olefins, 47.3% aromatics, and 44.6% saturated hydrocarbons.

This one-vessel process, integrated with a

conventional steam boiler should produce tar at a break-even cost of $0.07 per gallon.

Authors' Abstract

Coal Grinding Theory

Broadbent, S. R. and Callcott, T. G. COAL BREAKAGE PROCESSES. PART I: A NEW ANALYSIS OF COAL BREAKAGE PROCESSES. *J. Inst. Fuel* (British) *29*, 524-28; PART II: A MATRIX REPRESENTATION OF BREAKAGE, *ibid*, *29*, 528-39 (1956) December. PART III: THE ANALYSIS OF A COAL TRANSPORT SYSTEM, *ibid 30*, 13-17; PART IV: AN EXPLANATORY ANALYSIS OF THE CONE MILL IN OPEN-CURRENT GRINDING, *ibid 30*, 18-21; PART V: ANALYSIS OF CLOSED-CIRCUIT GRINDING, *ibid 30*, 21-25 (1957) January.

I. A breakage function (describing the size distribution of product) and a selection function describing the probability of breakage of each size of particle are combined to develop a full analysis of coal breakage processes. Vectors are used to express the distributions, also matrices which describe breakage processes. The theory, development, and definitions are explained. II. The mathematical representation of size distribution (sieve analysis) as a vector and its multiplication by the matrices (breakage law and selection law) are explained in detail. A numerical example is given. The expressions for effect of a selection-and-breakage process on a feed distribution is developed and its application to various grinding results to predict probability of breakage (pi-breakage) and of re-breakage (kappa-breakage) is given. III. Assuming the pi-breakage model, a modified shatter test on lump coal samples taken at four points of a producer fuel handling system was used to detect the point at which major breakage occurred. The handling system and sieving techniques are discussed in more detail in appendices by W. Scott. IV. A laboratory and a pilot--scale mill consisting of a single race of balls retained against the conical face of the rotor were tested in open-circuit with a sample of known size distribution to determine how matrix analysis and the pi-and kappa-breakage can describe breakage and performance. V. Further use of the matrix method is shown in the study of grinding in a closed-circuit (or recirculating) laboratory cone-mill. Equations, pi-and kappa-breakage, and product classification are explained as applied to an actual grinding problem. O. P. Brysch

Coke Ovens

Bureau, A. C., THE LECOCQ COKING SYSTEM. *Gas World* (British) *145, Coking Sect.* 67-71 (1957) April 6.

The heating system and other structural details of the Lecocq Twin-Flue, Integral Underjet Compound coke oven are given, and a recently completed installation of 156 ovens (13.5 net ton) at Zenica, Jugoslavia, is described and illustrated. O. P. Brysch

Coking Properties

Smith, F. W., Reynolds, D. A. and Wolfson, D. E. COKING PROPERTIES OF PITTSBURGH DISTRICT COALS. *Mining Eng. 9*, 360-64 (1957) March.

Results of evaluation tests made by the U. S. Bureau of Mines on the suitability of certain Pittsburgh area coals for coke making are presented. Items considered in the evaluation were: 1) coking and expanding properties; 2) relation of coking properties to coal rank; 3) blending properties; and 4) expanding properties. E. J. Pyrcioch

Hydrogen Production

Gorin, E. (assigned to Pittsburgh Consolidation Coal Co.) MANUFACTURE OF HYDROGEN. U. S. 2,781,248 (1957) February 12.

Hydrogen is produced from gaseous hydrocarbons by reaction with steam at 1400° - 1700° F. and 20-50 atmospheres in a fluidized calcium oxide bed, the latter employed to absorb the CO_2 reaction product. E. B. Shultz

H_2S REMOVAL

Schmidt, K. H. EINSATZ VON WASSERWERKSMASSE BEI DER TROCKENEN SCHWEFELREINIGUNG. (USE OF WATERWORKS PRECIPITATE IN DRY SULFUR REMOVAL). *Gas- und Wasserfach* (German) *98*, 207-11 (1957) March 1.

The long-known "waterworks-masse", a sludge precipitated during iron removal in purification of water,—was studied in the laboratory, compared with usual iron-oxide gas-purifying materials, and found to be entirely satisfactory, alone or in mixtures, for removal of hydrogen sulfide from gases. O. P. Brysch

Oil Gas

Deneke, H. UEBER DIE ERZEUGUNG VON STADTGAS AUS ERDOIELDERIVATEN (PRODUCTION OF CITY GAS FROM PETROLEUM DERIVITIVES). *Gas- und Wasserfach* (German) *98*, 201-06 (1957) March 1.

The new Segas process oil gas plant at Hameln is discribed and illustrated. Operating results and a cost analysis of gas production in this 21000 Nm^3 (750 MCF) per day unit are discussed. O. P. Brysch

Nicholls, F. H. OIL GASIFICATION AT YORK BY THE SEGAS PROCESS. *Gas World* (British) *145*, 616-19 (1957) March 23; *Gas J.* (British) *289*, 657-61, 664-66 (1957) March 27; *Gas Times* (British) *90*, 278-82 (1957) March 29.

The York Segas plant of 1 million SCF/day, and its operating results are discussed. Toxicity of vanadium in the oil ash (on checkerbrick) is mentioned. O. P. Brysch

ONIA GEGI PLANT AT CARLISLE. *Gas J.* (British) *290*, 37-39 (1957) April 3.

Since January a 1-million CF/day Onia Gegi oil gasification plant has been operating at the Carlisle Works of the Northern Gas Board. It is completely regenerative, operating on an 8-minute cycle with "1000 secs." heavy oil. Illustrated. O. P. Brysch

Shale Gas

Pismen, M. K., Ermakov, V. G. and Belyanin, U. E. GASIFICATION OF BALTIC SHALE IN A FLUIDIZED BED. *Gasovaya Promyshl.* (Gas Industry) (Russian) No. 3, 5-8 (1957) March.

Tests were made in a semi-industrial gas generator with fluidized bed to produce a heating gas from shale fines. Generator I. D. is 1.5 meters, height 9.5 meters, capacity 3000 cu meters/hr; gas heating value 1000 kcal/cu meter (15 BTU/SCF), gasification efficiency 52%, thermal efficiency 70% with waste heat boiler, bed temperature 800° C., and 1.39 cu meters of gas produced per kg of shale. Complete operating data and a flow diagram are included. J. W. Penney

Reformed Gas

Farnsworth, J. F., Bretz, G. M., McGurl, G. V. KOPPERS-HASCHE PILOT PLANT PRODUCING NATURAL GAS SUBSTITUTE AND LOW HEATING VALUE GAS. *Ind. Eng. Chem. 49*, 404-09 (1957) March.

The Koppers-Hatche furnace can reform hydrocarbon gases for producing either natural gas substitute or gases of low calorific value. This article, the first on cyclic non-catalytic operation for producing city gas by this process, describes pilot plant tests for reforming natural gas and propane. Heating requirements for the pilot plant are about 25% of the feed requirements for reforming. Maximum efficiencies are obtained at space velocities of 600 and 700 and reaction temperatures of about 2500°F. Carbon contained in the gas leaving the reformer, 3 to 4% by weight of feed, is readily removed by conventional gas cleaning equipment.

Authors' Abstract

Milbourne, C. G., Glover, C. B. CYCLIC CATALYTIC REFORMING PROCESS. *Ind. Eng. Chem. 49*, 387-91 (1957) March.

The United Gas Improvement Co.'s cyclic catalytic reforming process uses a fixed catalyst bed and operates on the cyclic principle. It reforms natural gas, propane, butane, gasoline, naphtha, and kerosene to produce a high hydrogen-content carrier gas for mixing with other gases to obtain the desired chemical composition for meeting gas utility sendout requirements. Recently, tests have been made to produce 500- to 1000-B.t.u. gases from Diesel oil, gas oil, and Bunker C oil. This process also produces ammonia synthesis gas from natural gas.

Authors' Abstract

Udex Aromatics

Bloch, H. S., Wackher, R. C. and Nenney, V. E. RECOVERY OF PURE AROMATIC HYDROCARBONS BY UDEX EXTRACTION OF COAL TAR LIGHT OILS. *Gas World* (British) *145*, 520-23 (1957) March 9.

Application of the Udex (aqueous diethylene glycol) extraction to five coal-tar light oils in a laboratory unit gave extracts of nitration-grade aromatics after clay-treatment. Catalytic refining (Unifining) of feedstocks to extractor resulted in super-pure products in high yields. Tabulated data on feeds, compositions, and products are given. O. P. Brysch

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Distribution Conference

The following papers were presented at the Distribution Conference, on April 8 to 11, 1957 at Houston, Texas, of the Operating Section, American Gas Association:

Bardeen, P. J. DESIGN CONSIDERATION FOR UTILITY OPERATIONS — VEHICLE PURCHASE SPECIFICATIONS. DMC-57-51

Blizzard, R. B. HIGH CYCLE ELECTRIC TOOLS—THEIR APPLICATION AND OPERATION—DMC-57-53

Burrell, R. E. TELEMETERING AND SUPERVISORY CONTROL FOR CENTRALIZED GAS DISPATCHING. DMC-57-15

Crossman, G. I. DESIGN OF DISTRIBUTION MAINS UNDER STREAMS AND RIVERS. DMC-57-5

Depp, F. CONTROL OF METER REPAIR COSTS THROUGH THE USE OF DIFFERENTIAL GAUGES. DMC-57-3.

Elliott, P. M. THERMOPLASTIC MATERIALS FOR PIPE. DMC-57-2

Gilmore, E. R. OPERATION AND MAINTENANCE OF METER PROVING EQUIPMENT. DMC-57-11

Kraemer, P. W. THE APPLICATION OF NON-LINTING PILOTS. DMC-57-13

Libby, H. T. THE USE OF PHOTOGRAPHY IN A GAS DISTRIBUTION DEPARTMENT. DMC-57-18

Lovretin, A. Jr. SYNTHETIC VS. LEATHER METER WASHERS. DMC-57-1

McDonell, W. C. QUALITY CONTROL FOR METER SHOP OPERATIONS DMC-57-20

Menkes, L. C. AUDIO TONE CONTROL IN GAS DISTRIBUTION SYSTEMS. DMC-57-6

Park, B. MECHANIC TRAINING. DMC-57-50

Peters, F. and Culp, E. R. METER INSTALLATION ECONOMICS — BATTERY POSITIVE DIAPHRAGM DISPLACEMENT VS. ROTARY DISPLACEMENT VS. ORIFICE METERS IN COMBINATIONS. DMC-57-4

Raglin, F. E. FOUR-WHEEL DRIVE APPLICATIONS. DMC-57-16

Rohret, L. C. AN INTERIM REPORT UPON THE FACTORS AFFECTING UNACCOUNTED-FOR GAS.

Scott, H. W. THE FOLLOW-THROUGH ON APPLIANCE APPROVALS. DMC-57-17

Stone, R. L. NEW TABLES FOR QUICK DESIGN OF SAFE GAS VENTS. DMC-57-14

Turpish, J. V. and Pruitt, R. D. FACTORS TO CONSIDER IN SELECTING CUSTOMER SERVICE VEHICLES. DMC-57-12

Ungethuem, E. GUTENTITE. DMC-57-9

Von Almen, W. E. Tarapchak, A., Joachim, J. L. and Drake, D. L. MODERN METHODS OF SERVICE REQUEST DISPATCHING. DMC-57-10

Wallis, J. E. DRIVER TRAINING. DMC-57-10

Watters, G. F. TRANSPORTATION MANAGEMENT IN A PUBLIC UTILITY. DMC-57-8

Wilson, G. G., Kniebes, D. V. and Ellington, R. T. PRACTICAL ASPECTS OF DISTRIBUTION SYSTEM ANALYSIS WITH AN ELECTRONIC DIGITAL COMPUTER. DMC-57-19; *Gas 33*, 73-79 (1957) May.

Wurth, H. J. DESIGN CONSIDERATIONS FOR UTILITY OPERATIONS-DESIGN CONSIDERATIONS FOR SPECIAL PURPOSE EQUIPMENT. DMC-57-52

Drilling

Cooke, P. W. THE HYDRAULICS OF DRILLING AND MUD FLOW. *J. Inst. Petrol. 43*, 69-85 (1957) March.

For the most efficient removal of drilled debris

from a well bore, the most desirable type of flow in the annulus is turbulent. Calculations are presented to substantiate this viewpoint. Laminar flow is satisfactory and is an annular flow of at least one foot per second maintained. If laminar flow is required because of pumping limitations, it would be desirable to keep the plastic viscosity of the mud to a minimum.

P. B. Tarman

Drilling Patents

Fischer, K. E. and Sydow, H. DRILLING MUDS. U. S. 2,789,947 (1957) April 23.

Scotty, C. B. (assigned to Texas Company) DRILLING FLUID. U. S. 2,789,949 (1957) April 23.

Tronolone, V. J. (assigned to Texas Co.) LOST CIRCULATION. U. S. 2,789,948 (1957) April 23.

Logging

de Witte, A. J. SATURATION AND POROSITY FROM ELECTRIC LOGS IN SHALY SANDS. PART I. *Oil Gas J. 55*, 89-93 (1957) March 4.

Log interpretation of shaly sands is a controversial subject. These review articles endeavor to give an intergated treatment without becoming too theoretical. Part I deals with resistivity relationships between clean and shaly sands.

R. T. Ellington

de Witte, A. J. SATURATION AND POROSITY FROM ELECTRIC LOGS IN SHALY SANDS. PART II. *Oil Gas J. 55*, 115-21 (1957) April 15.

Part II deals with self-potential in clean and shaly formations. A practical method for computing saturation and porosity from electric logs is developed.

G. Kunst

Logging Patents

Arps, J. J. APPARATUS FOR LOGGING WELLS. U. S. 2,787,759 (1957) April 2.

Mayes, F. M. (assigned to Sun Oil Co.) ELECTRICAL PROSPECTING METHOD AND APPARATUS. U. S. 2,790,137 (1957) April 23.

Piety, R. G. (assigned to Phillips Petroleum Co.) METHOD AND APPARATUS FOR LOGGING WELLS. U. S. 2,787,757 (1957) April 2.

Poupon, A. (assigned to Schlumberger Well Surveying Corp.) INDUCTION WELL LOGGING. U. S. 2,790,138 (1957) April 23.

Walstrom, J. E. (assigned to California Research Corp.) APPARATUS FOR ELECTRICAL WELL-LOGGING. U. S. 2,787,758 (1957) April 2.

LP-Gas

Abell, C. NEEDED: A BALANCED LOAD BALANCING PROGRAM. *Butane-Propane News 19*, 32-38 (1957) March.

Suggestions are given for leveling out the seasonal curve by building planned summer loads at nearly constant volume. C. E. Pierson

Finney, S. HOW LPG GIVES YOU TOOTHPASTE. *Butane-Propane News 19*, 59, 61, 62 (1957) March.

Use of LP-gas in a bentonite rotary drying kiln has eliminated discoloration of the product by soot as was the case when fuel oil was used.

C. E. Pierson

Grevel, W. DER FLUESSIGGASVERTRIEB IN FLASCHEN FUER HAUSHALT UND GEWERBE: DIE MARKTANALYSE VON MINERALOEL UND SEINEN PRODUCTEN. (CONSUMPTION OF LIQUEFIED GASES IN BOTTLES FOR HOUSEHOLD AND INDUSTRY: A MARKET ANALYSIS OF PETROLEUM AND ITS PRODUCTION.) *Gas- und Wasserfach* (German) *98*, 253-57 (1957) March 15.

Opening a series of articles on consumption of liquefied gases, the author presents a review of German petroleum supply and refining.

O. P. Brysch

Pipeline Construction

Westall, D. J. PIPELINE CONSTRUCTION TECHNIQUE. *Petroleum* (British) *20*, 96-98 (1957) March.

Special problems are attached to pipelaying in countries which are heavily populated and which contain large areas of private property. The author reviews the techniques used and points out that modern pipeline construction has become specialized and is well described

as civil engineering to which the principles of mass production have been applied. Pipeline engineering uses "conveyor belt" techniques and possesses the same characteristic urgency. With its basis in civil and production engineering, it has an atmosphere of military organisation. Author's Abstract

STEEL PIPE BEGINS TO ROLL AT WELLAND PLANT. *Can. Gas J. 50*, 14, 15 (1957) April.

Welland Tubes, Inc., at its new Welland, Ont. pipe mill began operation of the $10 million installation during April. Production of 20 to 36-inch diam pipe, at 3 miles per day, and the mechanized operations of the mill are briefly described. O. P. Brysch

Research and Utilization

The following papers were presented for discussion purposes at the Research and Utilization Conference of the American Gas Association at Cleveland on May 7, 8, and 9, 1957.

Bacon, T. S. GAS AND THE HEAT PUMP.

Chandler, M. THE UTILIZATION OF RESEARCH.

Davis, K. T. REQUIREMENTS CHANGE, TOO.

Ellington, R. T. ABSORPTION COOLING MERITS FURTHER DEVELOPMENT EFFORT.

Griffiths, J. C. FLAME CHARACTERISTICS OF DRILLED AND SLOTTED PORT BURNERS.

Johnson, G. B. HOW RESEARCH HAS BENEFITED THE GAS UTILITIES.

Kirk, W. B. INCINERATOR DEVELOPMENTS THROUGH RESEARCH.

Klein, J. WHO SETS THE TEMPO?

Kraemer, P. W. EXPERIENCES WITH LOW BTU AND/OR NON-AERATED PILOTS.

Morehouse, H. P. THE GAS REFRIGERATOR VERSUS ELECTRIC REFRIGERATOR UNDER HOME LOAD CONDITIONS.

Lowe, F. J., Jr. SERVICE PROBLEMS RELATED TO HEATING.

Nash, G. M. THE PREPARATION OF SMOKELESS - ODORLESS INCINERATOR REQUIREMENTS.

Ryder, F. A. PROGRESS IN VENTING RESEARCH.

Smith, R. L. ENERGY TRANSFORMATIONS CHALLENGES THE SCIENTIST.

Stack, A. E. STUDY OF RANGE TOP BURNER LOW INPUT PILOTS.

Tegler, L. T. HIGH-SPEED TABLE-TOP WATER HEATERS.

Vandaveer, F. E. VENTING GAS APPLIANCES—RESEARCH AND FIELD APPLICATION.

Vogel, O. B. THE HIGHLIGHTS OF DOMESTIC GAS COOKING RESEARCH.

Weast, R. C. CORROSION OF DOMESTIC WATER HEATERS.

Wilson, C. W. UTILIZATION OF JET COMPRESSORS FOR AIR CONDITIONING SYSTEMS.

Wood, C. C. ELIMINATING FIELD PROBLEMS FROM GAS CONTROLS.

San Juan Basin

Mayborn, M., OIL AND GAS BRING NEW LIFE TO VAST FOUR CORNERS AREA. *Drilling 18*, 84-87 (1957) April.

Magnolia Petroleum Co. brings new life to a once barren and desolate land in the San Juan Basin. Others call it the Four Corners Area. It covers part of Arizona, Colorado, New Mexico, and Utah. B. E. Eakin

Underground Storage

Benz, G. R. (assigned to Phillips Petroleum Co.) UNDERGROUND STORAGE SYSTEM. U.S. 2,787,125 (1957) April 2.

In accordance with this invention an underground storage for liquefied petroleum gas is provided which is capable of storing large

quantities at a small unit cost. Further a number of operating and safety features are provided to insure trouble-free operation, and easy, reliable introduction and removal of the material. G. Kunst

Knappen, R. S. (assigned to Gulf Oil Corporation) METHOD FOR DEVELOPING CAVITIES IN SALT OR OTHER SOLUBLE ROCK. U.S. 2,787,455 (1957) April 2.

This patent is concerned with a method of forming shaped underground cavities in soluble rock for the storage of gases or liquids, particularly petroleum products. It utilizes a casing, two concentric tubes, a solvent and a sealing liquid lighter than the solvent. G. G. Wilson

Secor, D. T. UNDERGROUND STORAGE OF GAS IN THE UNITED STATES DECEMBER 31, 1956. A.G.A. Sixth Ann. Report on Statistics, Comm. Und. Storage, A.G.A. Transmission Conf, San Francisco, May 8, 1957; Amer. Gas Assoc. Monthly *39*, 2, 3 (1957) May.

An increase of 1.306 trillion CF during the year 1956 has brought ultimate underground storage capacity to 3.402 trillion CF. Ten new pools, 686 wells and 68000 compressor HP were added. H. L. Feldkirchner

Well Practice

Brown, C. C. WELL HEAD APPARATUS. U. S. 2,788,073 (1957) April 9.

Brown, C. C. WELL HEAD EQUIPMENT FOR WELLS WITH MULTIPLE PIPE STRINGS. U. S. 2,788,074 (1957) April 9.

Garrett, H. U., Peters, C. M. and Dinning, R. W. (assigned to U. S. Industries, Inc.) WELL FLOW CONTROL APPARATUS AND SYSTEM. U. S. 2,790,395 (1957) April 30.

Goodwin, L. O. (assigned to Pan American Petroleum Corp.) METHOD OF FRACTURING A WELL FORMATION. U.S. 2,788,072 (1957) April 9.

Holbrook, O. C. (assigned to Pure Oil Co.) SELECTIVE TREATMENT OF GEOLOGICAL FORMATIONS. U.S. 2,787,325 (1957) April 2.

Hughes, W. B. (assigned to Cities Service Res. and Development Co.) REMOVAL OF CALCIUM SULFATE SCALE. U.S. 2,787,326 (1957) April 2.

McLeod, N. A. MEANS AND METHOD FOR STIMULATING THE FLOW OF WELL FLUIDS AND FOR DECLOGGING WELL BORE WALLS AND WELL CASING PERFORATIONS. U.S. 2,790,388 (1957) April 30.

Pelzer, H. L. (assigned to Sinclair Oil and Gas Co.) OIL RECOVERY PROCESS. U.S. 2,788,-071 (1957) April 9.

Peterson, C. B. (assigned to Texas Co.) OIL WELL TREATMENT TO PREVENT CONING. U.S. 2,788,855 (1957) April 16.

Well Tools

Atkinson, A. E. DEVICES FOR CLEANING THE WALLS OF BORE HOLES. U.S. 2,787,-328 (1957) April 2.

Boynton, A. (assigned to Garrett Oil Tools, Inc.) REMOTELY CONTROLLED FLOW VALVE. U.S. Re. 24304 (1957) April 23.

Hanes, J. W. E. (assigned to Borg-Warner Corp.) DRILL PIPE PROTECTOR. U.S. 2,789,870 (1957) April 23.

Kline, A. K. and Conrad, M. B. (assigned to Baker Oil Tools, Inc.) PACKER AND TUBING STRING COMBINATION. U.S. 2,788,-857 (1957) April 16.

Moseley, C. F. SELF-LUBRICATING OIL WELL STUFFING BOX. U.S. 2,789,846 (1957) April 23.

Ortloff, J. E. (assigned to Esso Research and Engineering Co.) PLUNGER ARRANGEMENT FOR CLOSING WELL CASING. U.S. 2,788,856 (1957) April 16.

Pearson, A. W. JUNK FISHING TOOL. U.S. 2,787,327 (1957) April 2.

Wiley, B. F. (assigned to Phillips Petroleum Co.) IMPROVED APPARATUS FOR MAKING MEASUREMENTS IN A WELL. U.S. 2,788,662 (1957) April 16.

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Custody Transfer

Resen, L. HUMBLE TRIES L.A.C.T., GIVES IT STAMP OF APPROVAL. *Oil Gas J. 55,* 94-99 (1957) March 4.

The automatic custody transfer system approved by the Texas Railroad Commission uses positive displacement meters for measuring the flow out of lease tanks into the pipeline. Experience with 1.25 million barrels shows that meters record accurately even though wax incrustations exist in tanks, or though producer's equipment causes increase in flow off-lease.

R. T. Ellington

Fracturing

Coburn, R. W. NEW FRACTURE TECHNIQUES MAKE POSSIBLE CUSTOM-DESIGNED WELL STIMULATION. *Oil Gas J. 55,* 102, 107 (1957) March 4.

Injection rate and ball sealer experiments in fracturing wells had led to engineered well completions. The article reviews determination of the best injection rate, number of stages, sizes and type and quantity of blocking agent, and volume of fluid and sand. R. T. Ellington

Hydrogenation

Manne, R. S., Boynton, H. G. and Souby, A. M. GENERAL PURPOSE HYDROGENATION PILOT PLANT. *Ind. Eng. Chem. 49,* 640-45 (1957) April.

The 0.5 to 3.0 bbl/day pilot unit for pressure catalytic hydrogenation at Humble Oil is described in considerable detail. The equipment has been used for feedstocks ranging from gas oils to fluxed asphalts, at pressures and temperatures up to 800 psi and 850° F. Catalyst volume is about 1.25 gallons in the 2-inch I. D. by 8-foot I. I. reactor. Typical data for hydrogenation of gas oil, crude oil, reduced crude and asphalt are shown. E. B. Shultz

Injection Practise

Parks, C. F. and Helberg, W. N. B FOR AILING INJECTION WELLS: STABILIZED ACID. *Oil Gas J. 55,* 100-01 (1957) March 4.

Periodic restoration of permeability in injection wells may be obtained through acid treatment. A stabilized acid is said to remove deposits and prevent secondary deposition of byproducts of acid reaction. R. T. Ellington

Todd, M. AUTOMATION APPLIED TO FLOODING AT NAVAL RESERVE POOL. *Oil Gas J. 55,* 84-87 (1957) March 4.

Features of water treatment and control facilities are discussed. R. T. Ellington

Oil Product Economics

REFINERY YIELDS - I. THE BIG SQUEEZE II. THE DISTILLATES PROBLEM. III. THE GASOLINE PROBLEM. *Petrol. Week 4,* 36, 39, 40, 43-48, 51, 52 (1957) March 22.

Major restrictions in flexibility of product yield patterns of refineries are those imposed by (1) increases in product quality, (2) product quantity required by market, (3) crude oil type and prices, (4) product value. General economic relationships between prices of crude and products are outlined, and operating techniques used to obtain maximum yields of gasoline and distillates are described. O. P. Brysch

Petroleum Composition

Glasgow, A. R. Jr., Gordon, R. J., Willingham, C. B., Mair, B. J. and Rossini, F. D. HYDROCARBONS IN THE 116° TO 126°C. FRACTION OF PETROLEUM. *Anal. Chem. 29,* 357-60 (1957) March.

Results of the continuing work of Amer. Petroleum Inst. Research Project 6 are reported, covering 22 hydrocarbons (from octanes, and substituted heptanes, hexenes and pentanes groups) which were separated from a petroleum fraction and identified by distillation and spectrography. O. P. Brysch

Solvent Drive

NEW RECOVERY IDEA LOOKS LIKE A CHAMP. *Oil Gas J. 55,* 96-99 (1957) March 11.

Oil recoveries now running 50 to 60 per cent after thorough water or gas driving show promise of ultimate recoveries of 85 to 90 (or more) percent of the oil in a reservoir by a new technique. Pioneered by Atlantic Refining Co. and followed by Humble, Carter and Sun now are making laboratory and field tests of the miscible-phase displacement method of sweeping the reservoir with a solvent which is miscible with the remaining crude. Three variants, 1) injecting butane-propane slugs and chasing with dry gas, 2) cycling rich (casinghead) or butane-doped gas, or 3) injecting dry

gas at very high pressures (the pioneer, now in 2 field tests) have shown promise by spectacular increases in daily production and reduced gas-oil ratios. Although these seem more costly for the future because of prices of sweep gas and solvents (and all vary depending upon local geology) there is a feeling that the methods are practical, perhaps even economic, and well worth development. O. P. Brysch

Uranium Geology

Masters, J. A. KERR-McGEE USES OIL GEOLOGY TO FIND URANIUM. *Indep. Petrol. Assoc. Amer. Monthly 27,* 44, 63, 64, 66, 68, 69-70 (1957) April; *Petrol. Week 4,* 28-31 (1957) May 10.

Large scale core-drilling techniques are described (and illustrated) as used in uranium exploration by the Kerr-McGee Oil Industries, Inc. Sedimentary deposits at Ambrosia Lake near the San Juan basin are systematically explored by geologists trained in oil practices.

O. P. Brysch

7. ANALYTICAL METHODS AND TESTS

Air Pollutants

Kanter, C. V., Lunche, R. G. and Fudurich, A. P. TECHNIQUES OF TESTING FOR AIR CONTAMINANTS FROM COMBUSTION SOURCES. *J. Air Pollution Control Assoc. 6,* 191-99 (1957) February.

Experience gathered in 8 years by the Air Pollution Control District, Los Angeles, in tests of air contamination by combustion sources has established the described basic methods of sampling and analyzing emissions for particulate and gaseous contaminants. O. P. Brysch

Coal Pile Density

Davis, J. E. ONE WAY TO MEASURE COAL-PILE DENSITY. *Power 101,* 94-95 (1957) March.

A sampling procedure is described for determining the average density of a coal storage pile. Average density is emphasized because this method includes both surface coal and coal deeper in the bed. In essence, a sample hole of reasonable depth is made with a mobile auger by boring through a hole in the bottom of a sample container, to retain all of the material removed for weighing. Volume is determined by the weight of water required to fill a plastic liner-bag inserted in the test hole. An example is shown of the test procedure in a coal storage pile used to determine tonnage on hand.

J. M. Reid

Electron Microscopy

Watson, J. H. L. CARBON REPLICATION OF PARTICULATES AND ULTRAMICROSCOPIC CRYSTALS. *Anal. Chem. 29,* 562-6 (1957) April.

Single crystals and particles of colloidal size can be easily carbon-mounted and carbon-replicated for electron microscopy.

Author's Abstract

Furnace Slags

McCoy, J. W. THE SYSTEMATIC ANALYSIS OF DEPOSITS FROM OIL-FIRED FURNACES. *Amer. Soc. Testing Mat. Bull.* No. 221, 59-63 (1957) April.

Furnaces fired with residual fuel oils suffer from slag and deposit formation of various forms and degrees. A procedure for analyses for Fe, Al, V, Pb, Ni, Ca, Mg, Na, Si, S and C on small samples is discussed. Sampling and interferences are described. O. P. Brysch

Industrial Analysis

ANALYTICAL REVIEWS—REVIEW OF INDUSTRIAL APPLICATIONS. *Anal Chem. 29,* 589-734 (1957) April (II).

This is the third annual presentation of the Analytical Reviews, Industrial Applications Group. Papers by 21 authors covering 15 fields are given. Subject fields treated are—air pollution, automatic operations, clinical chemistry, coatings, essential oils, ferrous metallurgy, fertilizers, food, solid and gaseous fuels, nonferrous metallurgy, pesticides, petroleum, pharmaceuticals, natural and synthetic rubbers, water. A 22-page advertised-products guide is included. D. M. Mason

Infrared Analysis

INFRARED ANALYSIS RIGHT ON THE BENCH. *Chem. Processing 20,* 158-60 (1957) March.

A small, compact infrared unit, which requires only 120 v 60-cycle AC, has been developed. This analyser can scan a spectral range from 2.5 to 15.0 microns. An automatic recorder drum allows unattended service; this drum also synchronizes with any wavelength.

P. B. Tarman

Isotopes

Littlejohn, R. F. and Spencer, D. H. T. THE USE OF RADIOACTIVE TRACERS. *Brit. Coal Utilis. Res. Assoc. Monthly 21,* 53-64 (1957) February.

This article reviews some of the more recent applications of radioactive tracers as applied to the field of fuel technology and outlines some future extensions of the tracer technique.

E. J. Pyrcioch

Swift, W. E. KRYPTON-85 SOURCE IMPROVES INDUSTRIAL THICKNESS GAGES. *Nucleonics 15,* 66, 67 (1957) March.

The use of krypton-85 isotope as a beta source in industrial thickness gauges improves the signal-to-noise ratio of these instruments and is much less costly than the more popular beta sources strontium-90 and thallium-204. There is no particular toxicity or radiation hazard problem with the gaseous krypton isotope.

C. G. von Fredersdorff

Olefin Determination

Miller, J. W. and DeFord, D. D. SPECTROPHOTOMETRIC TITRATION OF OLEFINS WITH ELECTRICALLY GENERATED BROMINE. *Anal. Chem. 29,* 475-79 (1957) April.

Olefins are determined using electrically generated bromine and a spectrophotometric endpoint. Using 3- to 11-mg. samples, a precision of better than 2% was obtained.

Authors' Abstract

Sulfur Determination

Hale, C. C., Quiram, E. R., McDaniel, J. E. and Stringer, R. F. ESSO LAMP METHOD FOR SULFUR. *Anal. Chem. 29,* 383-88 (1957) March.

An integrated and rapid lamp method for determination of total sulfur in petroleum has been developed and cooperatively tested. Modified finishing methods consist of the following: conductometric for nonleaded samples, nephelometric for leaded or nonleaded samples in the range of 1 p.p.m. to 0.06%, and gravimetric which avoids the conventional digestion and ignition steps. The cooperative testing was among four Esso Research and affiliated laboratories and involved 12 plant-type samples. The reproducibility for conductometric and gravimetric finishing showed a standard deviation which varied from 0.0008 to 0.015 over the sulfur concentration range of 0.01 to 1.0%. The reproducibility for nephelometric finishing varied from 1.1 to 12 over the range of 5 to 500 p.p.m. Authors' Abstract

Stinsky, F. TITRIMETRISCHE BESTIMMUNG VON GELOESTEM SCHWEFEL IN MINERALOELEN UN FETTEN. (DETERMINATIONS OF DISSOLVED SULFUR IN MINERAL OILS, AND FATS BY TITRATION. *Erdoel und Kohle* (German) *10,* 231 (1957) April.

A method of analysis is described to determine the so-called "active" sulfur in mineral oils, fats and similar products. Samples in acetone solution are titrated with KCN using bromcresol purple indicator. About an hour of time is used for its completion compared to 24 hours time used in other methods with no change in accuracy. G. Kunst

Sullivan, P. J. ANALYTICAL METHODS TO DETERMINE TOTAL SULFUR RAPIDLY, IN VOLATILE HYDROCARBONS. *Petroleum Eng. 29,* C19 (1957) April.

Due to an urgency a new method to determine the total sulfur in volatile hydrocarbons was developed. The results are well within the tolerances of ASTM, and in addition a determination can be made within 35 minutes. G. Kunst

8. GENERAL AND PHYSICAL CHEMISTRY

Catalysts

Aller, B. V. RANEY COBALT HYDROGENATION CATALYSTS. I. THE PREPARATION OF THE CATALYST. *J. Appl. Chem.* (British) *7,* 130-34 (1957) March.

The preparation of Raney cobalt in a highly active form has been accomplished by treating fine mesh cobalt/aluminum alloy powders with alkali at 15-20° C. The influence of alloy particle size, preparation temperature and aluminum content on catalytic activity is demonstrated, and a comparison is made with the better known Raney nickel catalysts.

Author's Abstract

Burke, R. F., Motard, R. L., Canjar, L. N. and Beckmann, R. B. THE EFFECT OF CATALYST GRANULE SIZE ON THE HYDROGENATION OF BENZENE OVER A SUP-

PORTED NICKEL CATALYST. *J. Appl. Chem.* (British) *7*, 105-09 (1957) March.

In connection with the study of the hydrogenation of benzene to cyclohexane over nickel and nickel oxide supported on silica gel (see reference[11]) an examination of the effect of granule size of the catalyst has been made at temperatures 225°C, 250°C and 275°C. It was found that, with increasing state of sub-division, the experimental velocity constant, k_e, is proportional to the external surface area of the catalyst down to a certain granule size. Further subdivision has no effect on activity as, when the critical granule size is reached, a sufficient area is exposed so that all of the catalyst is adsorbed on the surface of the carrier.

Authors' Abstract

Pine H. and Postl, W. S. MODIFIED NICKEL CATALYST FOR THE HYDROGENOLYSIS AND ALKYLATION OF AROMATIC HYDROCARBONS. *J. Amer. Chem. Soc. 79*, 1769, 70, (1957) April 5.

It was found that when small amounts of sulfur-containing compounds are added to a nickel hydrogenolysis catalyst the latter is "modified" in such a way as to catalyze reaction which until now were associated with strong acid catalysts.

Authors' Abstract

CO_2 Compressibility

Cook, D. THE SECOND VIRIAL COEFFICIENT OF CARBON DIOXIDE AT LOW TEMPERATURES. *Can. J. Chem. 35*, 268-75 (1957) March.

The fixed volume expansion method for gas compressibility measurements previously employed under conditions of high temperature and high pressure has now been developed for low temperature and low pressure measurements. Measurements of the second virial coefficient of carbon dioxide in the temperature range —60°C. to +30°C., and in the pressure range 0.5 to 2.5 atmospheres, are reported.

D. M. Mason

Diffusion

Chou, C. H. and Martin J. J. DIFFUSION IN GASES AT ELEVATED PRESSURES. *Ind. Eng. Chem. 49*, 758-62 (1957) April.

A trace of $C^{14}O_2$ in mixtures of CO_2-H_2 and CO_2-propane was used to determine diffusion coefficients at 35°-100° C. and 6 to 250 atm. The product of density and diffusion coefficient was essentially constant at constant temperature and composition. The use of this relationship for rough estimation of coefficients in multiple-component dense mixtures is discussed.

E. B. Shultz

Equation of State

Lype, E. F. THE DETERMINATION OF THE EQUATION OF STATE FROM WAVE-FRONT OBSERVATIONS. Amer. Soc. Mech. Eng. Paper No. 56-A-129, New York (1956) November 25.

The equation of state and the specific heat of a substance are related by certain differential equations to the pressure-density changes incurred by that substance under the influence of a shock wave. These differential equations make it possible to obtain thermodynamic properties from observations of the phenomena of wave propagation. A simple example illustrates the application of the "Hugoniot Function" which possesses the qualities of a property of state.

G. Kunst

Rice, M. H. EQUATION OF STATE OF WATER TO 250 KILOBARS. *J. Chem. Phys. 26*, 824-30 (1957) April.

An equation of state for water, applicable in the pressure range 25 to 250 kilobars, was formed in terms of data from shock wave measurements. This equation is then used to calculate P-V relation, for several adiabats and isotherms.

G. Kunst

Equilibria

Yates, W. F. VAPOR-LIQUID EQUILIBRIA IN BINARY SYSTEMS. *J. Amer. Chem. Soc. 79*, 1037-40 (1957) March 5.

An equation containing two parameters has been derived from kinetic considerations which relates instantaneous vapor-liquid equilibria in binary systems. The two constants appearing in the equation have been described in terms of the thermodynamic properties of the mixtures concerned.

Author's Abstract

Fluid Flow

Lester, C. B. HYDRAULICS FOR PIPELINERS. PART XXI: LOSSES THROUGH FITGS. *Pipe Line News 29*, 20, 22-24, 26 (1957) April.

Formulas for fluid flow are applied in a discussion of the resistance effects of valves and fittings, and the lack of accurate information on losses in fittings. Pigott's (ASME) papers and the data of Crane Company, Tube Turns, and Nordstrom Valve Company are discussed.
O. P. Brysch

Whitesel, H. A. CAPILLARY TWO-PHASE FLOW. *Refrig. Eng. 65,* 42-44 (1957) April.

In this investigation of the simultaneous flow of gas and liquid through capillaries, two general formulas have been developed. First, one was developed for a non-condensible gas and a non-volatile liquid and the other was specifically developed for "Freon-12." G. Kunst

Hydrocarbon Properties

Streiff, A. J., Schultz, L. H., Hulme, A. R., Tucker, J. A., Krouskop, N. C. and Rossini, F. D. PURIFICATION, PURITY, AND FREEZING POINTS OF 20 API RESEARCH HYDROCARBONS. *Anal. Chem. 29,* 361-64 (1957) March.

Preparation of 20 pure hydrocarbons is outlined and their distillation and freezing characteristics are tabulated by Amer. Petroleum Inst. Research Project 44. These were chiefly in the substituted C_5, C_6, and C_7 groups.
O. P. Brysch

Modern Research

Jordan, L. A. MODERN METHODS OF RESEARCH. *Chem. and Ind.* (British) No. 11, 306-18 (1957) March 16.

A lecture is reported which describes recent research achievements based on such modern techniques as the electron microscope, molecular distillation, chromatography, light scattering, ultraviolet, infrared and Raman spectroscopy and magnetic resonance spectrometry.
E. B. Shultz

Oxygen Impurities

Karwat, E. OXYGEN PLANT SAFETY. *Chem. Eng. Process 53,* 188, 89 (1957) April.

Acetylene is the "number one" enemy of oxygen plants; dangers of solid acetylene are discussed; design factors are considered. Catalytic oxidation of hydrocarbons is technically feasible, but still too expensive. C. L. Tsaros

McKinley, C., Himmelberger, F. THE ROLE OF AIR CONTAMINANTS IN FORMULATING OXYGEN PLANT SAFETY PRINCIPLES. *Chem. Eng. Prog. 53,* 112M-121M (1957) March.

Safe operation of air separation equipment is a subject of growing importance because of the great increase in use of tonnage oxygen. Although air is considered one of the safest of industrial raw materials, it can carry contaminants responsible for hazards in air separation plants. What happens to air contaminants when they get into oxygen plants and how they are removed from liquid oxygen are discussed. Freezing and boiling points, solubility in oxygen and explosive limits of contaminants are given. Explosion initiators, conditions of hazard, explosion characteristics and prevention, and monitoring of plant streams are all discussed. C. L. Tsaros

Plastic Flow

Thomsen, E. G. A NEW METHOD FOR THE CONSTRUCTION OF HENCKY-PRANDTL NETS. Amer. Soc. Mech. Eng. Paper No. 56-A-14 (1956) November.

The purpose of this paper is to point out some additional features of a graphical method for the rapid construction of Hencky-Prandtl nets. This method can be used on the physical plane as well as the velocity plane for flow of plastic solids. The use is illustrated by examples.
G. Kunst

Shock Compression

Walsh, J. M. and Rice, M. H. DYNAMIC COMPRESSION OF LIQUIDS FROM MEASUREMENTS ON STRONG SHOCK WAVES. *J. Chem. Phys. 26,* 815-23 (1957) April.

High explosives were used to drive strong shock waves into various liquids and a moving-image camera was employed to determine velocities associated with the shock waves. The shock-wave-reflection experimental method is described, the purpose of which was to measure the useful thermodynamic variable $(\Delta H/\Delta V)_p$ at high pressures. G. Kunst

Solar Furnaces

Farber, J. and Davis, B. I. ANALYSIS OF LARGE APERTURE PARABOLIC MIRRORS FOR SOLAR FURNACES. *J. Opt. Soc. Amer. 47,* 216-20 (1957) March.

Equations are derived for computing the concentrating effectiveness, flux level at the focal plane and maximum temperatures attainable

with parabolic mirrors. The results show a theoretical maximum of 5200° K obtainable in solar furnaces under black body conditions. This is somewhat lower than the 6000° K estimated surface temperature of the sun. Numerous graphs are included.

C. G. von Fredersdorff

Thermal Conductivity

Briggs, D. K. H. THERMAL CONDUCTIVITY OF LIQUIDS. *Ind. Eng. Chem. 49,* 418-21 (1957) March.

Determinations of thermal conductivity were carried out on coal tar compounds. A general equation for commercial distillates is proposed: $10^5 K = 32 - 0.02 t$ cal./cm. sec. ° C. Many of the values for pure components have not been previously recorded; those which have are in good agreement with earlier workers, at 20° C. Although there is good agreement in the literature on values at room temperature, high temperature data show wide divergences, resulting in uncertainty as to the variation of thermal conductivity with temperature.

Author's Abstract

Eckert, E. R. G., and Irvine, Jr., T. F. A NEW METHOD TO MEASURE PRANDTL NUMBER AND THERMAL CONDUCTIVITY OF FLUIDS. *J. Appl. Mech. 24,* 25-28 (1957) March.

The method is based on a unique relationship between temperature recovery factor and the Prandtl number, and indirectly thermal conductivity, for laminar high-velocity boundary-layer flow. Results are presented for air at atmospheric pressure. R. T. Ellington

Gambill, W. R. YOU CAN PREDICT GAS CONDUCTIVITY. *Chem. Eng. 64,* 277-82 (1957) April.

Examples of empirical methods for predicting gas thermal conductivity are given.

W. G. Bair

Thermodynamic Functions

Li, J. C. M. THERMODYNAMIC FORMULAS FOR TWO-PHASE SYSTEMS. *J. Chem. Phys. 26,* 909-13 (1957) April.

Bridgman's table of thermodynamic formulas is extended to a two-phase system of one, two, and three components. The present method includes these tables as special cases and can be generalized to any system. Author's Abstract

9. ORGANIC CHEMISTRY

Acetylene

Freeman, J. P. and Emmons, W. D. THE REACTION OF DINITROGEN TETROXIDE WITH ACETYLENES. *J. Amer. Chem. Soc. 79,* 1712-16 (1957) April 5.

The addition of dinitrogen tetroxide to dialkylacetylenes has been effected; the products isolated were the corresponding cis- and trans-dinitroolefins, an α, α-dinitroketone.

Authors' Abstract

Cyclopropane

Frey, H. M. FORMATION OF CYCLOPROPANE FROM METHYLENE AND ETHYLENE. *J. Amer. Chem. Soc.* (Commun.) *79,* 1259, 60 (1957) March 5.

Cyclopropane was found to be the immediate product of reaction between methylene and ethylene. D. M. Mason

Detergents

Taylor, F. P. DETERGENTS FROM PETROLEUM. *Petroleum 20,* 103-05 (1957) March.

Petroleum has the predominant place as a starting point for the synthesis of detergents. The author surveys the industry from its beginnings to the present day. The circumstances which led to the production of synthetic detergents, and their advantages over the common soaps are treated. The main types are discussed and their methods of manufacture outlined.

Author's Abstract

Hydrocarbon Structure

Brook, J. H. T. REACTION OF HYDROCARBONS WITH TERT.-BUTOXY RADICALS. *Faraday Soc. Trans.* (British) *53,* 327-32 (1957) March.

The rates of hydrogen abstraction from 30 hydrocarbons using di-tert-butyl peroxide were determined relative to the unimolecular decomposition of the butoxy radical. The effect of the hydrocarbon structure is discussed in terms of steric considerations in the analysis of the results for branched, cyclic, and aromatic hydrocarbons. S. A. Weil

Hydrogenation

McQuillin, F. J. THE MECHANISM OF HYDROGENATION REACTIONS. *Chem. and Ind.* (British) No. 9, 251-52 (1957) March 2.

The literature on mechanisms is surveyed,

with particular reference to hydrogen transfer and steric factors. E. B. Shultz

Organic Sulfur

Scott, D. W., Finke, H. L., McCullough, J. P., Messerly, J. F., Pennington, R. E., Hossenlopp, I. A. and Waddington, G. BUTANETHIOL AND 2-THIAPENTANE. EXPERIMENTAL THERMODYNAMIC STUDIES BETWEEN 12 AND 500°K.; THERMODYNAMIC FUNCTIONS BY A REFINED METHOD OF INCREMENTS. *J. Amer. Chem. Soc. 79,* 1062-68 (1957) March 5.

Thermodynamic properties between 0 and 1000°K are reported. D. M. Mason

Phenyl Ions

Meyerson, S. and Rylander, P. N. ORGANIC IONS IN THE GAS PHASE. III. $C_6H_5^+$ IONS FROM BENZENE DERIVATIVES BY ELECTRON IMPACT. *J. Amer. Chem. Soc. 79,* 1058-61 (1957) March 5.

Alkylbenzenes and alkylbenzene derivatives under electron impact give rise to $C_6H_5^+$ ions. They have been assumed to be phenyl ions formed by cleavage of the side chain from the ring. Spectra of labeled molecules furnish evidence that the $C_6H_5^+$ ions derived from phenyl alkyl ketones and 2-methyl-2-phenylalkanes do have the phenyl structure. On the other hand, those derived from δ-chloroethylbenzene and ethylbenzene are formed by a process involving ring cleavage. D. M. Mason

Propyl Radical

Smid, J. and Szwarc, M., n-PROPYL AFFINITIES OF AROMATIC AND OLEFINIC COMPOUNDS. *J. Amer. Chem. Soc. 79,* 1534-37 (1957) April 5.

Relative rates of addition of n-propyl radicals to aromatic and olefinic compounds in isooctane solution at 65° C. Authors' Abstract

Pyrolysis

Wellman, R. E. and Walters, W. D. THE THERMAL DECOMPOSITION OF ETHYLCYCLOBUTANE. *J. Amer. Chem. Soc. 79,* 1542-46 (1957) April 5.

The thermal decomposition of ethylcyclobutane has been studied over the pressure range 7-400 mm. at 450° C. and at 420-460° C. for pressures of 10 to 200 mm. The products were found to be almost exclusively ethylene and 1-butene. The decomposition is a homogeneous, first-order reaction which is not inhibited by nitric oxide, propylene or toluene. The temperature dependence of the experiments with initial pressures of 10-200 mm. gave an activation energy of 62± 1 kcal./mole. The first-order rate constant can be expressed as $k = 3.6 \times 10^{15}$ (e) (exp—62000/RT) per sec.

Authors' Abstract

Xylene Markets

MORE VALUE WITH EACH STEP — INCENTIVE FOR XYLENE DEVELOPMENT. *Chem. Week 80,* 33-38, 42 (1957) April 6.

Large amounts of mixed xylenes and other aromatics result from catalytic reforming of paraffinic or naphthenic hydrocarbons. Modestly priced as a high-octane mixture (3 to 4 cents/lb), the 3 xylene isomers when separated command premium prices, and when oxidized to the phthalic acids, would yield a 6-fold price in plastic and fiber markets. Research and development activities in phthalic compound production by nine companies are reviewed, with an outline of chemistry, processes, patents and end-uses. Standard (Indina) is building a $10 million plant of 60 million lb/year at Joliet, Ill. O. P. Brysch

10. CHEMICAL ENGINEERING

Ammonia Purification

Wan, S. W., Strelzoff, S. and Barr, C. J. (assigned to Chemical Construction Corp.) SEPARATION OF CARBON DIOXIDE FROM AMMONIA. U. S. 2,785,045 (1957) March 12.

A method for separating CO_2 and ammonia by absorbing CO_2 and some ammonia in a solution of monoethanolamine. Nearly all this ammonia is removed in an initial stripping zone. The solution from this column is heated and flows to the main stripping tower where the CO_2 is stripped out. C. L. Tsaros

Computation

Landau, H. G. A SIMPLE PROCEDURE FOR IMPROVED ACCURACY IN THE RESISTOR-NETWORK SOLUTION OF LAPLACE'S AND POISSON'S EQUATION. *J.*

Appl. Mech. 24, 93-97 (1957) March; *Amer. Soc. Mech. Eng.* Paper No. 56-A-13 (1956) May.

The necessity of solving these equations frequently arises in steady-state heat transfer, incompressible fluid flow and elasticity problems. Solution can be obtained by use of electrical resistor networks. This article deals with reducing the lumping error by adding resistors without increasing the number of mesh points. R. T. Ellington

Desiccants

Queer, E. R. TYPICAL DEHUMIDIFICATION PROBLEMS AND THEIR SOLUTION. *Heatg, Pip. Air Condg. 29,* 164-67 (1957) March.

Various applications of chemical desiccant dehumidifiers for storage spaces are discussed. E. B. Shultz

Ross, W. L. DEHUMIDIFICATION BY SOLID ADSORBENTS. *Heatg, Pipg. and Air Condg. 29,* 161-64 (1957) March.

Definitions of adsorption and desorption are made, and operating characteristics of solid adsorbent dehumidification machines are considered. Advantages and disadvantages over other ways of drying air are given. E. B. Shultz

Dust Removal

Weber, H. E. and Keenan, J. H. HEAD LOSS IN FLOW THROUGH A CYCLONE DUST SEPARATOR OR VORTEX CHAMBER. *J. Appl. Mech. 24,* 16-21 (1957) March.

An analysis is presented for predicting head loss in flow through a cyclone dust separator. The agreement between the theoretical and experimental results is good and shows that for relatively large ratios of inlet to exhaust area a momentum analysis, omitting all friction forces, gives a good representation of head loss. As the ratio approaches zero, a transition from vortex flow to flow without rotation occurs. R. T. Ellington

Fluid Flow

Koestel, A. JET VELOCITIES FROM RADIAL FLOW OUTLETS. *Heatg, Pipg. and Air Condg. 29,* 139-46 (1957) March.

A general equation for computing velocities in radial jets is presented. The equation is compared with laboratory measurements made on jets produced by radial slots and nozzles, plaques and diffusers. Author's Abstract

Leva, M. GAS-LIQUID FLOW IN STACKED TOWERS. *Chem. Eng. 64,* 267-70 (1957) April.

Gas-liquid flow is discussed for the case when the packing is arranged in a regular geometric pattern. W. G. Bair

Fractionation

Hughmark, G. A. and O'Connell, H. E. DESIGN OF PERFORATED PLATE FRACTIONATING TOWERS. *Chem. Eng. Prog. 53,* 127M-132M (1957) March.

There has been a revived interest in the use of perforated plate fractionating towers, which were one of the first types used for vapor-liquid contact. A design method is presented here. Correlations are developed or extended from previous authors for (1) dry pressure drop, (2) wet pressure drop, (3) hydraulic-grodient, (4) weeping on the plate. C. L. Tsaros

Heat Transfer

Chaddock, J. B. FILM CONDENSATION OF VAPOR IN A HORIZONTAL TUBE. *Refrig. Eng. 65,* 36-41 (1957) April.

Dropwise condensation gives a heat transfer four to eight times that of film condensation, and whether or not the vapor is film-condensed on the outside or the inside of the condenser tube similarly affects the heat transfer rate. The study here reported was an investigation of the average deterioration of the heat transfer coefficient under inside rather than outside condensation on horizontal tubes. G. Kunst

Destable, P. CONTRIBUTION TO THE STUDY OF HEAT TRANSFER BETWEEN THE SOILS AND WALLS IN THERMAL INSTALLATIONS AND DWELLINGS UNDER NONSTEADY-STATE CONDITIONS (in French) *C. R. Acad. Sci. Paris 242,* 26, 3047-50, June 1956; *Appl. Mech. Rev. 10,* 122, No. 879 (1957) March.

Paper is concerned with a solution of the general Fourier equation which has the prescribed

form $\Theta(x, y, z, t) = \text{phi}(x, t)\phi(y, t)\text{psi}(z, t)$ with phi(x, t) and $\phi(y, t)$ denoting the temperature distribution in the two planes μ of symmetry of a slab of width 2l in x-direction and 2l′ in y-direction. Expressions for the rate of heat transfer through the base and for the function phi (x, t) are given. The note is sketchy and does not give results which can be applied to the solution of practical problems. J. Kestin

Douglas, J., Jr. ON THE ERRORS IN ANALOGUE SOLUTIONS OF HEAT CONDUCTION PROBLEMS. *Quart. Appl. Math. 14,* 3, 333-35 (Notes) October 1956; *Appl. Mech. Rev. 10,* 121, No. 872 (1957) March.

The constant diffusivity heat-conduction equation is considered. Replace space derivatives by their finite difference equivalents, but retain derivatives in the time variable. As is well known, this yields a system of ordinary differential equations. Hartree has conjectured that error is $O(\Delta x^2)$ where Δx is largest space increment. Here the conjecture is proved. Y. L. Luke

Newell, R. G. LOW-FINNED EXCHANGER TUBING. *Petrol. Processing 12,* 86-90 (1957) March.

The second of a series of three, the discussion centers on the operation of some petrochemical process condensers using low-finned tubing. In addition, design methods are outlined, and these methods are checked against the actual performance of the condenser. Author's Abstract

Paschkis, V., and Stolz, G., Jr. QUENCHING AS A HEAT TRANSFER PROBLEM. *J. Metals 8,* 8, 1074-75, Aug. 1956; *Appl. Mech. Rev. 10,* 122, No. 882 (1957) March.

Boundary conductance—the heat transfer from the surface of a quenched object to the quenchant—largely defines hardness resulting from quenching, according to this first report on a cooperative project carried out in the Heat and Mass Flow Analyzer Laboratory at Columbia University. Experimental technique is described. Authors' Summary

Mass Transfer

Bar-Ilan, M. and Resnick, W. GAS PHASE MASS TRANSFER IN FIXED BEDS AT LOW REYNOLDS NUMBERS. *Ind. Eng. Chem. 49,* 313-20 (1957) Feb. 21.

Mass transfer *j* factors were determined for fixed beds of spherical and cylindrical particles of naphthalene through which air was passed. The *j* factor was found to be independent of particle diameter for pelleted materials greater than 0.4 cm. diam. For smaller particles, the diameter appeared as a parameter in the conventional *j* factor vs Reynolds number plot. C. G. von Fredersdorff

Processing Techniques

D'Leny, W. CHEMICAL TECHNIQUES. *Chem. and Ind.* (British) No. 12, 338-45 (1957) March 23.

A general survey is given of manufacturing techniques in the chemical industry such as hydrogenation, carbonization, oxidation and catalysis. The developments in each field are treated in an historical and descriptive manner, with some discussion of possible future achievements. E. B. Shultz

Reactor Design

Snow, R. H. and Schutt, H. C. DESIGN OF AN ETHANE PYROLYSIS REACTOR. *Chem. Eng. Prog. 53,* 133M-138M (1957) March.

An improved method of design of a tubular reactor is presented. The method of Myers and Watson, which is time-consuming by ordinary methods has been adapted for automatic computer use. Product distributions for ethane pyrolysis were correlated by means of seven apparent overall reactions. The rates were empirically determined by trial and error calculation until computed and experimental product compositions agreed. Design of the pyrolysis coil so as to minimize carbon formation is discussed. C. L. Tsaros

SO_2 Recovery

Tarbutton, G., Driskell, J. C. and Jones, T. M. RECOVERY OF SULFUR DIOXIDE FROM FLUE GASES. *Ind. Eng. Chem.* 49, 392-95 (1957) March.

Four processes for recovering sulfur dioxide in useful form from coal combustion gases were investigated on a small scale. In the direct and indirect sulfuric acid processes, either a combination of manganese ion and ozone is used to catalyze oxidation, or sulfur dioxide is ab-

sorbed and oxidized by a slurry of regenerated manganese oxide. In the direct ammonium sulfate process, a combination of manganese ions and ozone is used to catalyze oxidation; in the direct phosphatic fertilizer process, sulfur dioxide is absorbed by a slurry of rock phosphate to render the phosphate soluble. The indirect sulfuric process is most promising.

Authors' Abstract

Water Treatment

Nordell, E. REMOVING COLOR FROM INDUSTRIAL PROCESS WATER. *Power 101,* 102-05 (1957) March.

The problem of color removal from process water when color is detrimental to the process is discussed with respect to the equipment and chemical treatments which are available and effective. Data are presented for occurrence of color in process water and for chemical treatments and their results in plant use. This article does not deal with contaminants in the concentration range common to objectional plant wastes.

J. M. Reid

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Calorimeter Accuracy

Eiseman, J. H. and Potter, E. A. ACCURACY OF THE CUTLER-HAMMER RECORDING GAS CALORIMETER WHEN USED WITH GASES OF HIGH HEATING VALUE. *J. Res. Nat. Bur. Standards 58,* 213-16 (1957) April.

The accuracy of the Cutler-Hammer recording gas calorimeter, when used with gases of high heating value, is discussed. The study includes the preparation of a standard gas of high heating value, a comparison of hydrogen and methane as calibrating gases, the effect upon the instrument of changes in room and tank-water temperature, the instrument's accuracy when burning propane, the effects of bleeder-burner height, and the effects of differences in inlet gas pressure. It is concluded that an accuracy of 0.25 percent, or even better, can be obtained with the Cutler-Hammer calorimeter if certain precautions are carefully followed.

Authors' Abstract

Ejectors

Berkeley, F. D. EJECTORS GIVE ANY SUCTION PRESSURE. *Chem. Eng. 64,* 255-60 (1957) April.

This comprehensive article covers the theory and operation of several types of ejectors.

W. G. Bair

Gaskets

Cannon, R. HOW TO CHOOSE AND USE TODAY'S GASKETS IN TODAY'S EQUIPMENT. *Petrol. Processing 12,* 95-113 (1957) March.

A special 16-page report describes the uses, materials available for manufacture, and selection of gaskets for various design conditions.

H. A. Dirksen

Dowtherm Piping

Cole, C. E. HOW TO INSTALL PIPING FOR HIGH TEMPERATURE HEAT TRANSFER. *Heatg, Pipg. and Air Condg. 29,* 99-101 (1957) March.

Good practice for installation of Dowtherm piping is described. Special provisions for cleanliness and leak prevention are considered.

E. B. Shultz

Process Controls

TELEVISION APPLICATIONS SPREAD THROUGHOUT INDUSTRY. *Power 101,* 96, 97 (1957) March.

Widespread use of closed circuit television in industrial and manufacturing applications is predicted. The jobs handled by television are many and varied. Some which may be of particular interest to the gas industry include monitoring from one location, process equipment and controls distributed in other areas, operation of nuclear reactors, training of large groups in skills requiring close observation and internal inspection of tanks, equipment and piping. A unique miniature camera is described that is small enough to inspect the inside of boiler tubes.

J. M. Reid

Pump Seals

Tracy, H. E. SELECT BEST PUMP SEAL. *Chem. Eng. 64,* 239-54 (1957) April.

Data for selecting the best pump seal are given for a variety of operating conditions.

W. G. Bair

Valves

Cummings, H. L. and Marsh, H. L. CHOOSE

AND USE THE RIGHT VALVE. *Power 101*, 98, 99 (1957) March.

This is a brief discussion of the factors to consider in selecting process valving. Both do's and don't's are mentioned. J. M. Reid

Viscometry

Walters, R. and Eakin, B. E. SIMPLIFIED HIGH-PRESSURE ELECTRODE ASSEMBLY. *Rev. Sci. Instruments 28*, 204 (1957) March.

In an improved high-pressure Rankine-type viscometer, electrical insulation of the electrode is secured at inner and outer faces of the bomb by use of fiber washers, and the high-pressure seal is effected by use of a Neoprene or Teflon O-ring. Authors' Abstract

12. MATERIALS OF CONSTRUCTION

Arc Welding

NEW ARC WELDING PROCESS. *Materials and Methods 45*, 168-72 (1957) March.

Linde Air Products Co. has developed a new semiautomatic metal arc welding process. The process features a continuously-fed wire electrode shielded in an atmosphere of carbon dioxide. The electrode is magnetically coated with flux. The claims for this process are: greater simplicity, greater speed and lower costs.

H. L. Feldkirchner

Cathodic Protection

Everett, O. W. KEEP TAB ON CORROSION CONTROL PROGRAM. *Pipe Line Ind. 6*, 33-36 (1957) March.

First step in engineering a corrosion control system calls for attention to details before and during construction. Once the line is operating, a complete set of records will indicate performance and the economics of protection.

Author's Abstract

Hamilton, H. L. EFFECTS OF FOREIGN CONTACTS ON COATED PIPELINES. *Gas Age 119*, 25-27, 64 (1957) March 7.

Foreign contacts (physical and/or electrical) which make the application of cathodic protection systems virtually impossible, are discussed. Case histories are given. E. B. Shultz

Light, J. F. PREVENTING CORROSION INTERFERENCE WHEN CATHODICALLY PROTECTING BURIED STRUCTURES. *Chem. and Ind.* (British) No. 15, 452-55 (1957) April 13.

This essay considers corrosion interference from adjacent buried structures. The criterion of interference, instruments and testing methods, and interference limits are explained. Five methods of offsetting corrosion interference are presented, some not yet used in practice.

E. B. Shultz

Powell, H. M. and Morgan, J. H. CATHODIC PROTECTION FOR PIPELINES. *Petroleum 20*, 135-38 (1957) April.

The value of cathodic protection is being more extensively recognized, and in application it is important that the most economical results be achieved. The establishment of a method of accurate mathematical treatment of the costs of cathodic protection installations is the object. This was first given at the first European Corrosion Congress, in Paris. The general mathematical bases of design are briefly explained and a hypothetical pipeline of average characteristics is taken as an example. The paper indicates the effects upon design of such factors as size of individual installation, spacing of installations along the pipeline route, resistance of pipe coating, resistance of pipeline metal and distance of groundbed from pipeline. Authors' Abstract

Ransom, R. G. PROPERLY PLACED ANODES PROTECT STATION PIPING. *Pipe Line Ind. 6*, 20-23 (1957) March.

Good design calls for an anode to supply current to every "void" in a buried piping grid. Station personnel are the key to effective installation and maintenance of system.

Author's Abstract

Senatoroff, N. K. ECONOMICS AND EFFECTIVENESS OF CATHODIC PROTECTION ON LARGE DIAMETER PIPELINES. *Petrol. Eng. 29*, D26-D29 (1957) March.

A 70-mile section of 26-in. OD pipeline laid in 1931 was cleaned, repaired and new coating and cathodic protection installed in 1944. Investment and operating cost over the intervening years are discussed. O. P. Brysch

Trouard, S. E. CATHODIC PROTECTION OF THE COATED STEEL GAS MAIN DISTRIBUTION SYSTEM IN NEW ORLEANS. *Corrosion 13,* 151t-61t (1957) March.

A detailed report of the practical considerations involved in the cathodic protection program for the gas distribution system of New Orleans. Topics discussed include local topography and soil, experience with galvanic anodes and rectifiers and ground beds, and cost of cathodic praction. Data are given on a periodic rectifier survey and yearly tests of three zinc anodes.
G. G. Wilson

Coatings

Calsibet, R. A. VINYL COATINGS FOR METAL PRODUCTS. *Materials and Methods 45,* 130-34 (1957) March.

Specific information on the properties and applications of various vinyl resin coatings is given. Three main categories covered are: wash primers, solution coatings and dispersion coatings. H. L. Feldkirchner

Curtis, A. C., ADVANTAGES OF INTERNAL IN-PLACE COATING. *Gas 33,* 126-29 (1957) March.

The advantages of coating pipelines internally in-place are outlined. G. G. Wilson

Deadman, A. L. THE PEN SOFTENING POINT TEST (FOR BITUMINOUS MATERIALS). *J. Appl. Chem.* (British) *7,* 64-66 (1957) February.

The Pen Softening Point test described is a form of penetration test applicable to a very wide range of bituminous materials, giving also a basis on which temperature susceptibility can be defined. Author's Abstract

Dunbar, R. E. EPOXY COATINGS FOR METAL PRODUCTS. *Materials & Methods 45,* 130-34 (1957) April.

These coatings are noted for their excellent adhesion, flexibility, toughness and chemical resistance. Here is detailed information on the properties and uses of the six main types of formulations. Author's Abstract

Fair, W. F., Jr., Pittman, C. U. and Sturrock, M. G. TESTING OF COAL TAR COATINGS (II)—FIELD EXPOSURE IN COLD CLIMATES. *Corrosion 13,* 191t-94t (1957) March.

Tests are described in which pipe sections coated with 5 different coating and wrapping systems were buried in Canada at depths of 1 through 5 feet, then unearthed after one year's exposure and tested for holidays. The results of a similar test in which coated pipe sections were exposed to atmospheric temperature but sheltered from the elements are also presented.
G. G. Wilson

Fair, Jr., W. F. WHAT MAKES A GOOD PIPE LINE COATING? *Pipe Line Ind. 6,* 28-32 (1957) March.

Tests and field experience show what a coating will do; specifications serve as a safeguard to insure that you will receive the kind of protection you order. Author's Abstract

Kennedy, T. Jr. POLYVINYLIDENE CHLORIDE FILM AND MICROCRYSTALLINE WAX FOR PROTECTING UNDERGROUND PIPE. *Corrosion 13,* 186t-90t (1957) March.

Six case histories are given of the use of polyvinylidene chloride film in conjunction with microcrystalline wax to protect underground pipes. It was found that microcrystalline wax of high quality appears to be a superior wetting agent and when wrapped with a protective film of polyvinylidene chloride will thoroughly and permanently protect a pipe surface from corrosion where properly applied. Although further information must be accumulated to substantiate fully the performance of these materials in the field, results to date indicate that these materials provide superior protection.
Author's Abstract

Lower, E. S. and Cressey, S., PLASTICS-BASED STRIPPABLE COATINGS. *Corrosion Tech. 4,* 83-85 (1957) March.

Developments in plastic based strippable coatings are discussed, including methods of application and materials used. G. G. Wilson

NACE Tech. Unit Comm. T-2H. TENTATIVE RECOMMENDED SPECIFICATIONS FOR ASPHALT TYPE PROTECTIVE COATINGS FOR UNDERGROUND PIPE LINES-WRAPPED SYSTEMS. (Publn. 57-11,) *Corrosion 13,* 283t-85t (1957) April.

Descriptions are given of various systems using

asphalt, physical characteristics of primers and coatings, means of testing characteristics, recommended application criteria and handling of material after coating. An appendix gives a test for settlement of mineral filler in filled asphalt pipeline enamels. Authors' Abstract

Roberts, A. G. and Pizer, R. S. ELECTRONIC AVERAGING DEVICE FOR THE ADHEROMETER. *ASTM Bull.* (No. 221,) 53-58 (1957) April.

The speed and ease of operation of this improved adherometer and the precision of the measurements have been increased considerably beyond that previously attainable.
Authors' Abstract

CORROSION CONTROL WITH PLASTIC TAPE. *Gas 33,* 119-22 (1957) March.

The operation of coating 122 miles of 30-inch pipe with polyethylene plastic tape is described.
G. G. Wilson

PROTECTIVE COATINGS FOR ATMOSPHERIC USE: THEIR SURFACE PREPARATION AND APPLICATION REQUIREMENTS, PHYSICAL CHARACTERISTICS AND RESISTANCES. *Corrosion 13,* 215t-23t (1957) March.

This preliminary report of NACE Technical Unit Committee T-6B is a comprehensive survey of pertinent physical and chemical properties and application characteristics of 22 different types of coating materials for the protection of structures exposed to rural, industrial or marine atmospheres. G. G. Wilson

SUGGESTED COATING SPECIFICATIONS FOR HOT APPLICATION OF COAL TAR ENAMEL FOR MARINE ENVIRONMENTS. *Corrosion 13,* 209t, 210t (1957) March.

Task Group T-1M-2 of NACE Technical Unit Committee T-1M gives specifications and recommendations to contractors and operators who apply and purchase coal tar coatings systems in marine environments. Recommendations include surface preparation, materials and systems, handling of material, application and inspection. Similar information applied to painting is given in this issue, pages 205 to 208. Authors' Abstract

Construction Alloys

Inglis, N. P. RECENT ADVANCES IN METALLIC MATERIALS OF CONSTRUCTION FOR USE IN THE CHEMICAL INDUSTRY. *Chem. and Ind.* (British) No. 7, 1809 (1957) February 16.

New corrosion resistant stainless steels, copper and copper-base alloys, aluminum and aluminum-base alloys, titanium and titanium-base alloys, are considered. New fabrication techniques for heat-exchanger tubes, condensers and vessels, suitable for the new materials, are also presented. E. B. Shultz

CAST STAINLESS ALLOY IS STRONGER, MORE RESISTANT THAN 18-8. *Materials & Methods 45,* 172 (1957) April.

A new cast stainless alloy developed at the Corrosion Research Laboratories of Ohio State University is found to have better corrosion resistance and machinability than 18-8 stainless, and possesses good welding, grinding, and foundry characteristics. H. L. Feldkirchner

Corrosion

Benedict, L. P. CAUSES OF CORROSION AND PREVENTION WITH PIPE WRAP. *Gas Age 119,* 40, 41 (1957) April 4.

This paper considers the protection of pipelines from galvanic and stray currents by polyvinyl chloride wrapping. E. B. Shultz

Compton, K. G. VARIABILITY IN WORKING COPPER SULFATE HALF-CELLS. *Corrosion 13,* 149t, 50t (1957) March.

A brief summary of the results of the reproducibility of measurements utilizing copper sulfate half-cells. G. G. Wilson

Farmery, H. K. CORROSION RESEARCH LABORATORIES—11: FULMER RESEARCH INSTITUTE. *Corrosion Techn.* (British) *4,* 125-27 (1957) April.

A brief summary of the functions, facilities, and current work of the Fulmer Research Institute, a British industrial research organization that specializes in metallurgical problems.
G. G. Wilson

Emery, J. ACCIDENTAL CONTACTS IN A DISTRIBUTION SYSTEM. *Gas 33,* 55, 56 (1957) March.

Six case histories of accidental contacts of dis-

tribution system piping with other metallic structures including methods used to clear these contacts are discussed. G. G. Wilson

Kulman, F. E. CORROSION MITIGATION IN CONGESTED AREAS. *Gas 33*, 60, 61 (1957) March.

A brief summary of gas industry practice in regard to corrosion mitigation in congested areas. G. G. Wilson

Long, J. S. HOW TO GET 20-YEAR CORROSION PROTECTION. *Gas Age 119*, 29, 30, 32 (1957) April 4.

Proper selection of paint to get long service life from a single coat is explained.

E. B. Shultz

Romanoff, M. RESULTS OF BUREAU OF STANDARDS' 45-YEAR CORROSION STUDY. *Petroleum Eng. 29*, D28-D32 (1957) April.

Evidence of the controlling influence of the soil on the character of corrosion is exemplified for the commonly used ferrous metals and low-alloy steel. An evaluation of the effectiveness of galvanized coatings was included in the tests.

G. Kunst

High Temperature Piping

Blumberg, H. S. STEAM PIPING MATERIALS FOR HIGH TEMPERATURE SERVICE. *Materials and Methods 45*, 126-129 (1957) March.

The trend toward higher operating temperatures and pressures in steam power plants calls for a reappraisal of current piping materials. This article discusses present materials and new alloys now under development.

Author's Abstract

Inhibitors

Denman, W. L. and Friedman, C. B. THE EVALUATION OF COOLING TOWER CORROSION INHIBITORS. *Corrosion 13*, 179t-85t (1957) March.

The results of a study of several inorganic corrosion inhibitors conducted in a small scale commercial cooling tower are presented. Operating data from several inhibitor runs are reported and compared with observed corrosion rates in untreated runs. G. G. Wilson

Insulation

Edberg, E. A. POLYSTYRENE FOAM FROM EXPANDABLE BEADS. *Refrig. Eng. 65*, 54-57 (1957) March.

This low-temperature insulating material resists the passage of heat, water vapor and absorption of water. The insulation efficiency is also maintained over an acceptably long service life. G. Kunst

Monack, A. J. ELECTRICAL INSULATION MATERIALS. *Materials & Methods 45*, 145-160 (1957) April.

This manual is a survey of the major types of solid insulation materials and their electrical, mechanical and thermal properties. The discussion covers all common forms: films, sheets, and slabs, tapes, sleeving and flexible tubing, rigid tubing, rods, and moldings. Information is arranged in a systematic pattern to aid the engineer in selecting the optimum insulation for a specific application.

Plastics

Atkinson, H. E. A CRITICAL LOOK AT PLASTIC PIPING. *Canad. Chem. Proc. 41*, 51, 52, 54 (1957) March.

Lack of necessary data on plastics and its effect on experience to date are discussed with respect to (a) basic engineering requirements of plastics for piping, (b) current status in meeting these requirements (c) need for developments. Standards, data, and joining of sections are discussed for polyvinyl chloride, polyethylene, polystyrenes, and saran-lined steel.

O. P. Brysch

Ralph, T. L., CELLULOSE ACETATE BUTYRATE'S ROLE IN PROTECTION. *Corrosion Tech. 4*, 86-88 (1957) March.

A brief discussion of the uses of cellulose acetate butyrate in corrosion prevention in a coating or in the fabrication of pipe. G. G. Wilson

Webber, C. H. USE OF THERMO-PLASTIC PIPE FOR GAS DISTRIBUTION. *Gas 33*, 69, 70 (1957) March.

A short comparison of the relative merits of steel and plastic for distribution system piping. A summary of "do's and don't's" in the use of plastic pipe and a table of comparative costs of steel and plastic are included. G. G. Wilson

Wright, D. 1956 WAS RECORD YEAR FOR USE OF PLASTIC PIPE. *Gas 33,* 62-64 (1957) March.

A brief report on the results of a survey of 215 gas distribution companies on their present and future use of plastic pipe. G. G. Wilson

VINYLIDENE CHLORIDE RESINS. *Corrosion 13,* 211t-14t (1957) March.

A report, prepared by Task Group T-6A-3 of NACE Technical Unit Committee T-6A, summarizes the pertinent physical and chemical properties and application characteristics of coatings and linings of this material and its copolymers with vinyl chloride and acrylonitrile. G. G. Wilson

Refractories

Osborn, E. F. IMPORTANCE OF SPINEL PHASE IN THE STEEL INDUSTRY: I. *Ind. Heating 24,* 575-78 (1957) March.

The spinel structure, having 32 oxygen atoms in a close-packed cubic arrangement, is a critical structure in refractories and can occur in reforming catalyst structures. A number of chemical and crystallographic aspects are discussed. R. T. Ellington

Structural Graphite

Bennett, G. A., Inatomi, T. J. and Fiskin, J. M. (assigned to the United States of America) PREPARATION OF IMPERVIOUS GRAPHITE. U.S. 2,789,038 (1957) April 16.

Porous graphite is rendered impervious by depositing carbon particles in the pores by diffusing a hydrocarbon gas (acetylene, methane, propane)-helium mixture into the graphite shape under pressure at 2000° F. O. P. Brysch

Gaylord, W. M. and Miranda, M. A. THE FALLING-FILM HYDROCHLORIC ACID ABSORBER. *Chem. Eng. Prog. 53,* 139M-44M (1957) March.

The design and performance of impervious graphite absorption systems is discussed. These systems produce commercial strength acid solutions up to 36% HCl from gases with wide variations in hydrogen chloride content, ranging from 40 to 100 mole%. Design correlations for predicting performance of HCl absorbers are discussed. For these systems effect of HCl partial pressure, mass velocity, and mean molecular weight have been found to affect the overall result differently than would be expected from the usual mass transfer equations. C. L. Tsaros

13. NEW BOOKS

Atomic Energy, 1956

Atomic Energy Comm. MAJOR ACTIVITIES IN THE ATOMIC ENERGY PROGRAMS, JANUARY-JUNE 1956. Washington: G.P.O. (1956) July.

Major aspects of progress in the atomic energy programs during the first half of 1956 consisted of 1) legislation for atomic energy in private industry; 2) public and private planning for large-scale reactors for generating electricity; 3) construction permits for three power reactors; 4) allocation of 40,000 kilograms of nuclear fuel for research and power reactors abroad; 5) continued research on uranium production and development of reactor concepts and 6) research on controlled thermonuclear processes or fusion reactions. Production of uranium ore and concentrates has risen rapidly, with the U.S. now leading the free world. Upon completion of ore processing facilities the free world production of uranium oxide should exceed 30,000 tons/year. The experimental prototype power reactor program, which includes 10 types of reactors, will cost an estimated $236,000,000, with private industry contributing an additional $20,000,000 to this amount. The power reactor demonstration program, which includes development of 10 different reactors, is a joint effort of government and private industry will cost $128,000,000 private capital and $77,000,000 government funds. The independent industrial power reactor program sponsored totally by an estimated $210,000,000 private capital will include 5 additional reactors. C. G. von Fredersdorff

Nuclear Metallurgy

Finniston, H. M. and Howe, J. P. METALLURGY AND FUELS. Series V. New York: McGraw-Hill Book Co., Inc. 1956.

This is an extensive and excellent work on the production, fabrication, and alloying of uran-

ium metal, physical metallurgy of thorium, beryllium, zirconium and hafnium, including excellent sections on nuclear reactor fuel elements and cladding materials. Effects of radiation on covalent and ionic solids, on graphite, metals and alloys, and studies of neutron scattering and diffraction are summarized. Each chapter has ample diagrams, photographs and appended references.

C. G. von Fredersdorff

Petroleum Economics

FOURTH WORLD PETROLEUM CONGRESS PROCEEDINGS: Sect. IX. ECONOMICS, STATISTICS, EDUCATION. Rome: Carlo Colombo 1955.

This volume covers such topics as: a) interdependence as the foundation for world oil operations, b) the role of fuel oils and utilization of petroleum fuels and natural gas in Europe, c) energy consumption in Italy, d) limitations in the rights of property in relation to the laying of gas pipelines and e) oil and gas conservation in Venezuela. C. G. von Fredersdorff

Properties of Solids

Cremer, H. W. and Davies, T. CHEMICAL ENGINEERING PRACTICE: Volume 3—SOLIDS SYSTEMS. New York, Academic Press Inc., 1957.

Volume 3 of Chemical Engineering Practice deals with subjects on which there are very few quantitative calculations. Most work in the literature is descriptive in nature and this text treats these materials in a similar manner. The subjects which are covered in this text are: Methods of Sizing Analysis, Crushing and Grinding, Mechanics of Pulverizers, Screening, Grading, and Classifying, and Mixing, Storage, Handling, Sampling, Measuring and Gauging of Solids. There is also a chapter on the effect of air flow on solid particles in cyclones and on electroprecipitation units. Types of equipment which are used in these various processes have excellent illustrations. The authors have presented a fairly complete treatment of the subject and the work should be of great value to the profession. R. E. Peck

Refrigeration

Althouse, A. D. and Turnquist, C. H. MODERN REFRIGERATION. Goodheart-Wilcox Company, Inc., Chicago, 1956.

This book endeavors to cover practical aspects of many phases of refrigeration. Some effort is made to explain fundamentals to the service technician at the high school level, but emphasis is placed primarily on equipment construction, operation and repair. The following are some of the subjects treated: Refrigeration materials and service tools, compression systems and compressor construction, refrigerant and motor controls, motors, refrigerants, servicing systems and the service shop, absorption systems, hermetic units, commercial installations, load calculations, air conditioning systems and load calculations, automobile units and frozen food refrigerators.

R. T. Ellington

Thermodynamics

Zemansky, M. W. HEAT AND THERMODYNAMICS. 4th Ed., New York: McGraw-Hill Book Co. 1957.

The fourth edition of this book is designed as an intermediate textbook for students studying physics, chemistry or engineering. The author is a physicist and the book reflects this background. The chapters on change of phase, physics of very low temperatures, heterogeneous systems and the application of thermodynamics to special systems are of special interest. The chapter on ideal gas reactions may tend to oversimplify this subject. Each chapter is followed by a number of problems applying the principles discussed. C. L. Tsaros

Unit Operations

McCabe, W. L. and Smith, J. C. UNIT OPERATIONS OF CHEMICAL ENGINEERING. New York: McGraw-Hill Book Co., Inc. (1956).

This beginning text on unit operations contains enough material for a three semester course. Key chapters are No. 2, Fluid Mechanics, No. 8, Flow of Heat and No. 10, Mass Transfer. The text totals 905 pages, much larger than an earlier text coauthored by McCabe, reflecting a general increase in volume of standard course material in recent years. Many of the less conventional operations and more advanced subjects such as multicomponent separations and transient phenomena are not considered.

E. B. Shultz

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Periodicals Abstracted for GAS ABSTRACTS

Air Conditioning, Heating and Ventilating
Air Pollution Association, Journal
American Chemical Society, Journal
American Gas Association Monthly
American Gas Journal
American Institute of Chemical Engineers, Journal
American Petroleum Institute Quarterly
American Society for Testing Materials Bulletin
American Society of Mechanical Engineers. Transactions
Analytical Chemistry
Appliance Manufacturer
Association for Computing Machinery, Journal
Australian Journal of Applied Science
Australian Journal of Chemistry

Bituminous Coal Research Reports
Brennstoff-Chemie
British Coal Utilization Research Association Monthly Bulletin and Quarterly Gazette
Butane-Propane News

California Oil World
Canadian Chemical Processing
Canadian Gas Journal
Canadian Journal of Chemistry
Canadian Journal of Physics
Canadian Journal of Technology
Chemical and Engineering News
Chemical and Process Engineering
Chemical Engineering
Chemical Engineering Costs Quarterly
Chemical Engineering Progress
Chemical Engineering Science
Chemical Processing
Chemical Reviews
Chemical Society (London) Journal
Chemical Week
Chemistry and Industry
Coal Heat
Coke and Gas
Combustion
Combustion and Flame
Computers and Automation
Construction Methods and Equipment
Corrosion
Corrosion Technology

Drilling

Engineers' Digest
Erdöl und Kohle

Faraday Society. Transactions
Fuel
Fuel Efficiency
Fueloil and Oil Heat

Gas
Gas Age
Gas and Oil Power
Gas Council (British) Publications
Gas Heat
Gas Journal
Gas Times
Gas und Wasserfach
Gas World

Heating, Piping and Air Conditioning

Independent Petroleum Association of America Monthly
Industrial and Engineering Chemistry
Industrial Finishing
Industrial Gas (American)
Industrial Gas (British)
Industrial Heating
Institute of Fuel (British). Journal
Institute of Gas Technology Publications
Institute of Petroleum (British). Journal
Institution of Gas Engineers. Bulletins, Communications and Transactions
Instruments

Jet Propulsion
Journal des Usines a Gaz
Journal of Applied Chemistry
Journal of Applied Mechanics
Journal of Applied Physics
Journal of Chemical Physics
Journal of Metals
Journal of Organic Chemistry
Journal of Petroleum Technology
Journal of Physical Chemistry
Journal of Research (National Bureau of Standards)
Journal of Scientific Instruments

Laboratory Practice
LP-Gas
Lubrication

Materials and Methods
Mathematical Aids
Mechanical Engineering
Metal Progress
Mining Engineering

National Advisory Committee for Aeronautics, Reports
National Fire Protection Association Quarterly
National Gas Bulletin of Australia
National Petroleum News
Nuclear Science and Engineering
Nucleonics

Official Gazette of the U.S. Patent Office
Oil and Gas Journal

Petroleum
Petroleum Engineer
Petroleum Processing
Petroleum Refiner
Physics and Chemistry of Solids
Physics Today
Pipe Line Industry
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Refrigerating Engineering
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